DENSO

2D Code Handy Scanner

AT20Q-SM
AT21Q-SM

User's Manual

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Preface

Thank you for using the AT20Q / AT21Q DENSO WAVE 2D code Handy Scanner.

Please READ through this manual carefully. It will enable you to operate your scanner correctly.

After you have finished reading this manual, keep it handy for speedy reference.

Note: Do not use this scanner in an environment with electrical noise that can trigger malfunction.

Note: Specifications described in this manual are supported by AT20Q Firmware version 1.00 or later.

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Customer Registration and Inquiries

Customer Registration

To allow us to provide our customers with comprehensive service and support, we request that all customers complete a Member Registration Form. Registered members will be offered the following privileges.

- Latest upgrade information
- Free exhibition and event information for new products
- Free web-information service "QBdirect"

QBdirect Service Contents

Information search service (FAQ)	Offers detailed information on each product.
Download service	Offers downloads of repair modules for the latest AT20Q Series systems or software, and sample programs.
E-mail inquiries	Allows customers to send product-related queries by e-mail.

Please note that these privileges may be subject to change without prior notice.

How to Register

Access the URL below and follow the instructions provided.

http://www.qbdirect.net

SAFETY PRECAUTIONS

Be sure to observe all these safety precautions.

■ Please READ through these instructions carefully. They will enable you to use the scanner correctly.

■ Always keep this manual nearby for speedy reference.

Strict observance of these warnings and cautions is a MUST for preventing accidents that could result in bodily injury and substantial property damage. Make sure you fully understand all definitions of these terms and symbols given below before you proceed to the text itself.

⚠ **WARNING**	Alerts you to those conditions that could cause serious bodily injury or death if the instructions are not followed correctly.
⚠ **CAUTION**	Alerts you to those conditions that could cause minor bodily injury or substantial property damage if the instructions are not followed correctly.

Meaning of Symbols

A triangle (△) with a picture inside alerts you to a warning of danger. Here you see the warning for electrical shock.

A diagonal line through a circle (⃠) warns you of something you should not do; it may or may not have a picture inside. Here you see a screwdriver inside the circle, meaning that you should not disassemble.

A black circle (●) with a picture inside alerts you to something you MUST do. This example shows that you MUST unplug the power cord.

⚠ WARNING

To System Designers:

- When introducing the scanner in those systems that could affect human lives (e.g., medicines management system), develop applications carefully through redundancy and safety design which avoids the feasibility of affecting human lives even if a data error occurs.

- Never bring any metals into contact with the terminals in connectors.

  Doing so could produce a large current through the scanner, resulting in heat or fire, as well as damage to the scanner.
- Keep the AC adapter away from water.

  Failure to do so could cause fire or electrical shock.
- Never use the scanner on the line voltage other than the specified level.

  Doing so could cause the scanner to break or burn.
- Do not use the scanner where any inflammable gases may be emitted.

  Doing so could cause fire.
- Do not scratch, modify, bend, twist, pull, or heat the power cable of the AC adapter. Do not place heavy material on the cable or allow the cable to get pressed under heavy material.

  Doing so could break the cable, resulting in a fire.
- Do not subject the scanning window of the scanner to direct sunlight for extended periods.

  Doing so could damage the scanner, resulting in a fire.

- If smoke, abnormal odors or noises come from the scanner, immediately switch off the host computer, disconnect the AC adapter and the interface cable, and contact your nearest dealer.

  Failure to do so could cause fire or electrical shock.
- If foreign material or water gets into the scanner, immediately unplug the AC adapter and the interface cable, and contact your nearest dealer.

  Failure to do so could cause fire or electrical shock.
- If you drop the scanner so as to affect the operation or damage its housing, switch off the host computer, unplug the AC adapter and the interface cable, and contact your nearest dealer.

  Failure to do so could cause fire or electrical shock.

⚠ CAUTION	
Never disassemble	• Never disassemble or modify the scanner; doing so could result in an accident such as break or fire. Doing so could result in a fire or electrical shock.
	• Do not put the scanner on an unstable or inclined plane. The scanner may drop, creating injuries. • Never put the scanner in places where there are excessively high temperatures, such as inside closed-up automobiles, or in places exposed to direct sunlight. Doing so could affect the housing or parts, resulting in a fire. • Avoid using the scanner in extremely humid areas, or where there are drastic temperature changes. Moisture will get into the scanner, resulting in malfunction, fire or electrical shock. • Do not place the scanner anyplace where it may be subjected to oily smoke or steam, e.g., near a cooking range or humidifier. Doing so could result in a fire or electrical shock. • Never cover or wrap up the scanner or AC adapter in a cloth or blanket. Doing so could cause the unit to heat up inside, deforming its housing, resulting in a fire. Always use the scanner and AC adapter in a well-ventilated area. • Keep the power cable of the AC adapter away from any heating equipment. Failure to do so could melt the sheathing, resulting in a fire or electrical shock. • Do not scratch or modify the scanner or its interface cable. Do not bend, twist, pull, or heat the cable. Doing so could damage the scanner or its interface cable, creating a fire hazard. • Do not put heavy material on the scanner or its interface cable, or allow the cable to get pressed under heavy material. • Do not look into the light source from the scanning window or do not point the scanning window at other people's eyes. Eyesight may be damaged by direct exposure to this light. • Do not use the scanner if your hands are wet or damp. Doing so could result in an electrical shock. • Never use chemicals or organic solvents such as benzene and thinner to clean the housing. Do not apply insecticide to the scanner. Doing so could result in a marred or cracked housing, electrical shock or fire. • Do not use the scanner with anti-slip gloves containing plasticizer. The scanner housing may be broken, creating injuries, electrical shock, or fire. • Do not use or store the scanner in the place where strong magnetism or static electricity are likely produced near the processing machine or on the carpet. Doing so could affect the parts, resulting in malfunction or failure.

⚠ CAUTION	
	• When disconnecting the AC adapter from the wall socket, hold the AC adapter body not the power cable. The power cable may be broken, resulting in a burnt AC adapter, electrical shock, or fire. • If the interface cable is damaged (e.g., exposed or broken lead wires), stop using it and contact your nearest dealer. Failure to do so could result in a fire or electrical shock.
	• During electrical storm activity, always unplug the AC adapter from the wall socket. Exposure to power surges could result in a damaged scanner or fire. • When taking care of the scanner, unplug the AC adapter from the wall socket for safety. Failure to do so could result in an electrical shock. • Do not drop the scanner. The scanner housing may be broken, creating injuries. Using the scanner whose housing is broken could result in smoke or fire. Unplug the AC adapter from the wall socket and contact your nearest dealer.

Care and Maintenance

■ Proper Care of the reading window

Dust or dirt accumulating on the clear plate of the code reading window will affect reading performance. If you use the scanner in dusty areas, therefore, periodically check the clear plate and clean it if dusty.

- To clean the plate, first blow the dust away with an airbrush. Then wipe the plate with a cotton swab or the similar soft one gently.
- If sand or hard particles have accumulated, never rub the plate; doing so will scratch or damage it. Blow the particles away with an airbrush or a soft brush.

■ Proper Care of the Scanner body

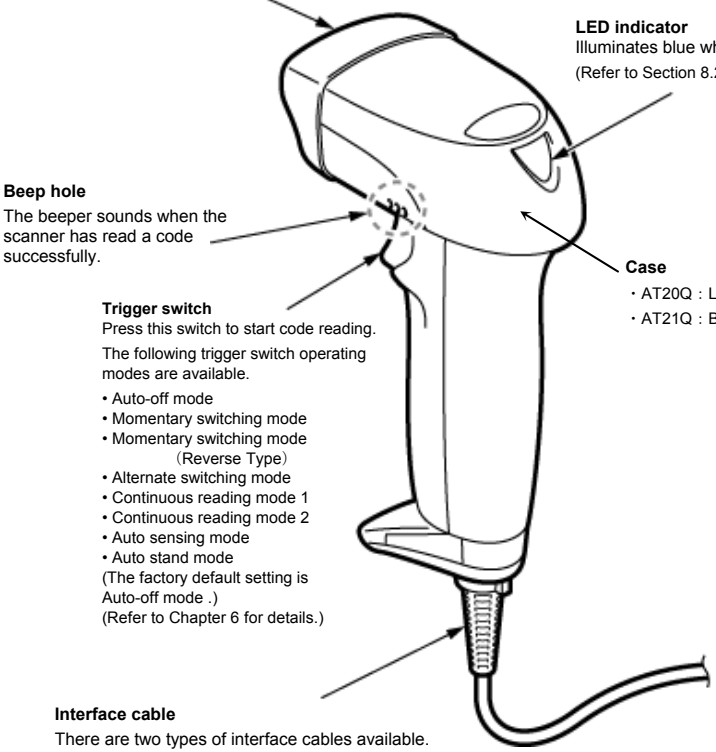
Wipe any dirt from the Scanner body with a dry, soft cloth.

Note

• Never use substances such as benzene or alcohol, as this may cause the housing to be marred or paint to peel off.

• If excessively dirty, wipe a soft cloth that has been soaked in soapy water (always use neutral detergent) and wrung out thoroughly.

Chapter 1 Names and Functions



Reading window
A code is placed at this reading window.

LED indicator
Illuminates blue when reading is complete.
(Refer to Section 8.2 for details.)

Beep hole
The beeper sounds when the scanner has read a code successfully.

Case
・AT20Q：Light gray
・AT21Q：Black

Trigger switch
Press this switch to start code reading.
The following trigger switch operating modes are available.
• Auto-off mode
• Momentary switching mode
• Momentary switching mode (Reverse Type)
• Alternate switching mode
• Continuous reading mode 1
• Continuous reading mode 2
• Auto sensing mode
• Auto stand mode
(The factory default setting is Auto-off mode .)
(Refer to Chapter 6 for details.)

Interface cable
There are two types of interface cables available.
- RS-232C interface cable
- USB interface cable

The interface cable connects your scanner to a host computer or other host equipment.
Depending upon the interface cable plugged into the scanner, the scanner automatically switches to the RS-232C interface or USB-COM interface.
(Refer to Chapter 3 for the cable connection and setting up of the USB interface.)

Note: The bottom case is not securely held in the scanner case when the interface cable and its connector case cover are not plugged into the case. If the bottom case comes off, fit it firmly in the scanner case again, and connect the interface cable and then the connector cover over it.

Chapter 2 Preparation

2.1 Operating Environment for the Use of USB Interface

Using the scanner via the USB interface requires a host computer equipped with a USB port. The operating environment differs depending upon whether you use the USB-COM interface or USB keyboard interface as listed below.

USB-COM interface:

To use this interface, you need to install the dedicated Active USB-COM port driver (virtual COM port driver) to the host computer. This interface allows you to use the scanner in applications using the conventional serial port. For instructions on how to set up the driver, refer to Chapter 3, Section 3.2.1. For the interface specifications, refer to Chapter 9, Section 9.2. This interface is selected by default.

USB keyboard interface:

No dedicated USB device driver is required. Via this interface, data scanned by the scanner can be entered to the cursor position in your application. For instructions on how to set up the driver, refer to Chapter 3, Section 3.2.2. For the interface specifications, refer to Chapter 9, Section 9.3.

You can switch between the USB-COM interface and USB keyboard interface by using the QR-coded parameter menu (provided in Chapter 12) or the configuration software (ScannerSetting_2D)*.

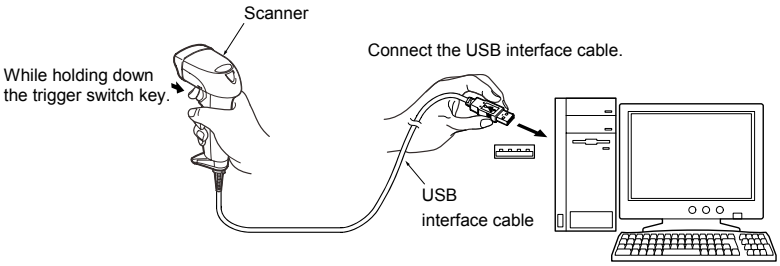
	To use the USB-COM interface (factory default):	**To use the USB keyboard interface:**
Host computer	PC/AT or AT/AT compatible PC equipped with a USB port	
Operating System (OS)	Windows XP, x32 Edition Windows Vista, x32 Edition Windows 7, x32 and x64 Edition	Windows XP, x32 and x64 Edition Windows Vista, x32 and x64 Edition Windows 7, x32 and x64 Edition
USB driver	Active USB-COM port driver provided by DENSO WAVE	OS-supplied device driver

Note: The scanner cannot be used on Windows NT that does not support any USB device.

The interface can be switched between the USB-COM interface and USB keyboard interface by using either the:

Firmware version Ver.1.00 or Ver.1.01

- Using QR-coded parameter menu (provided in Chapter 12),
- Using the configuration software (ScannerSetting_2D),* or
- Connecting the scanner's USB interface cable to the host computer or USB hub with the trigger switch being held down. (If the USB-COM interface has been set up, doing so switches to the USB keyboard interface, and vice versa.) (Interface switching when power turned ON is disable by default)

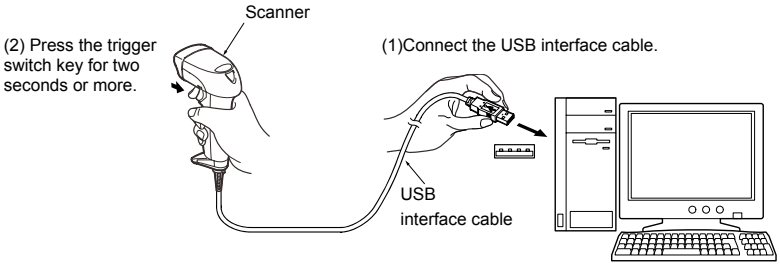


The interface setting will be retained even if the scanner is turned off.

Firmware version Ver.1.10 or later

- QR-coded parameter menu, or
- Configuration software (ScannerSetting_2D) *

If the Active USB-COM port driver is not installed in the computer, (1) connect the scanner's USB interface cable to the computer or its USB hub, and (2) press the trigger switch for more than two seconds.
However, this applies only when the USB-COM interface is set up, in which case the interface can be switched from the USB-COM interface to the USB keyboard interface. Switching the interface vice versa is not supported.



Note: For approx. 20 seconds after switching from the USB-COM interface to the USB keyboard interface, the scanner cannot accept data entry.

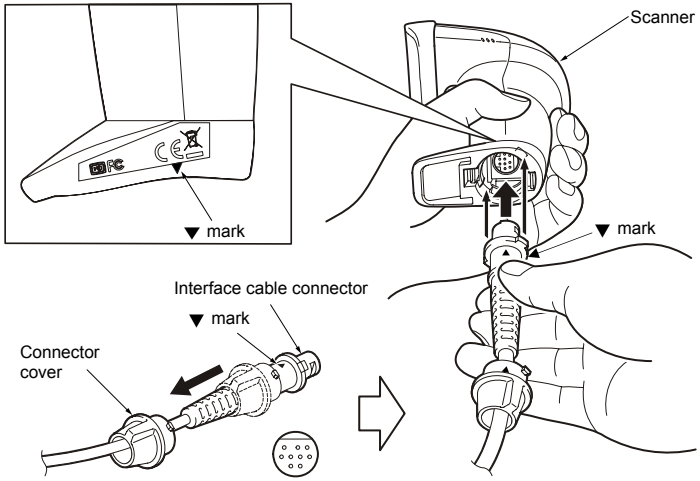
* Registered users can download the configuration software (ScannerSetting_2D) from QBNet, their customer support section on the Denso Wave website at no extra charge.
For further details on QBNet or to register, visit the following URL.
http://www.qbdirect.net

2.2 Connecting the Interface Cable to the Scanner

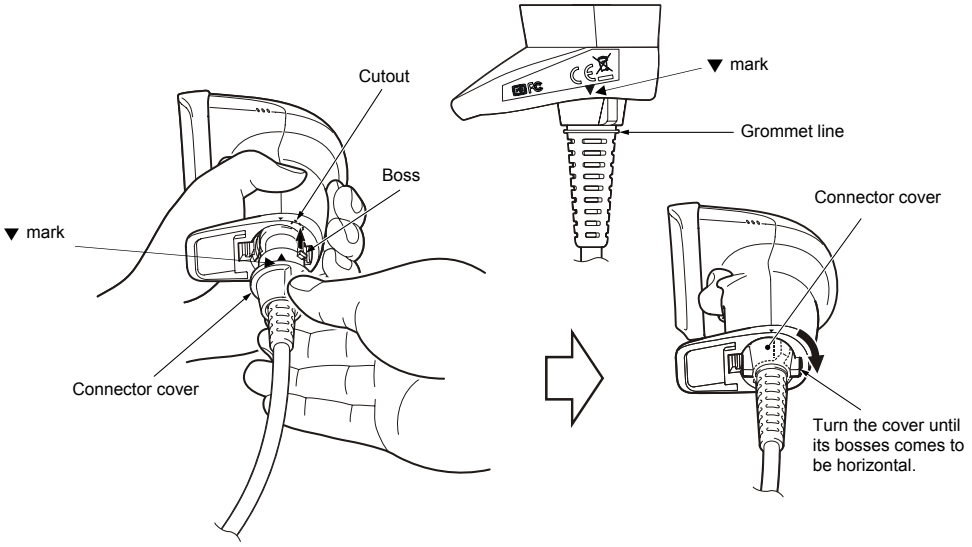
(1) Pull the connector cover of the interface cable off its connector as shown below.

(2) Plug the interface cable connector into the connector located in the bottom of the scanner.

Note: As shown below, hold the scanner body, align the ▼ mark on the cable connector with that on the scanner, and fully insert the interface cable connector.



(3) Align the ▼ mark on the scanner with that on the connector cover, and fully insert the connector cover to the scanner until the grommet line is shown. Then, turn it clockwise until the boss on the connector cover becomes horizontal against the scanner.

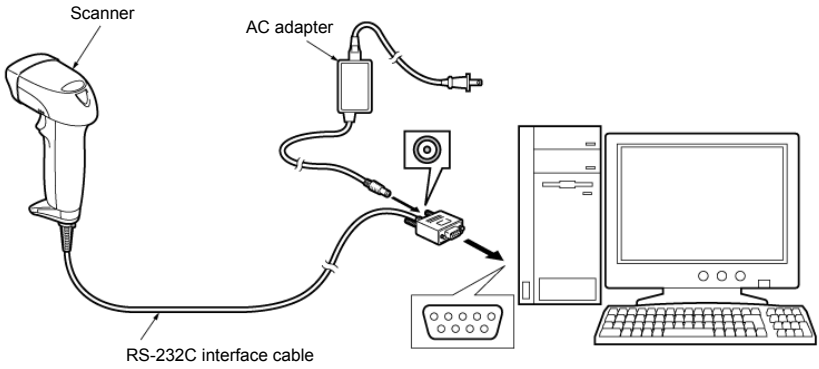


Chapter 3 Connection to the Host Computer

3.1 Using the RS-232C Interface

(1) AC adaptor-powered type

1) Connect the RS-232C interface cable to the host computer.



2) Plug the AC adapter into the DC power jack provided in the interface cable connector.

Note: When disconnecting the interface cable or DC power jack, hold the connector housings not the cables. Pulling cables will result in breaks.

Note: Avoid connecting and disconnecting of connectors all if possible. Doing so may result in weak contact.

Note: Be sure to use the adapter exclusively designed for the scanner.

(2) Host computer-powered type

1) Connect the RS-232C interface cable to the host computer *

2) Secure the connector if it is equipped with a lock *.

* Refer to the specifications for details of the interface cable connector types, pin assignments and lock facility.

Note: When disconnecting the interface cable or DC power jack, hold the connector housings not the cables. Pulling cables will result in breaks.

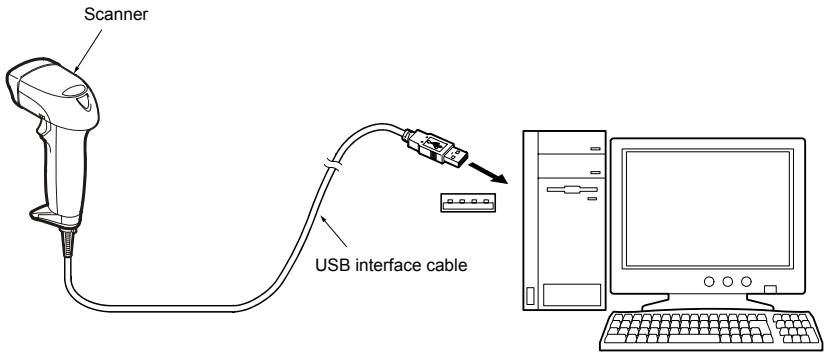
Note: Avoid connecting and disconnecting of connectors all if possible. Doing so may result in weak contact.

3.2 Using the USB Interface

The scanner receives and sends data from/to the host computer through the USB-COM interface or USB keyboard interface. You need to set up the device driver designed for the interface to be used.

Notes for connecting the USB interface cable

- To use the USB-COM interface, you need to install the serial port driver to the host computer before connection of the USB interface cable. For details, refer to Section 3.2.1.



- When plugging and unplugging the USB connector, put an interval of at least 10 seconds between those actions since Windows may take several to 10 seconds to add or delete the USB device.
- Hot plugging/unplugging is allowed for USB devices. However, do not plug or unplug the USB connector when:
  - The computer is on standby (in Suspend mode) or
  - The COM port is open with the USB-COM interface being used. (Hot plugging/unplugging under this condition will lose data.)
- When the host computer is processing the scanner connection, do not plug or unplug any other USB device cables.
- Directly connect the scanner to the USB port on the host computer or to the self-powered hub. The scanner may not be connected to some types of hubs. If the operation of the hub-connected scanner is unstable, connect it directly to any USB port on the host computer.
- Do not use any extension cord.

3.2.1 Setting up the USB-COM interface

Using the USB-COM interface requires installing the Active USB-COM port driver provided by DENSO WAVE to the host computer. The driver does not come with the scanner in a CD-ROM. It can be downloaded for free from our website at:

http://www.qbdirect.net

The file downloaded contains the Active USB-COM port driver and uninstaller which are compressed. It is a self-extracting file. Store the file into a folder and then double-click its icon to extract it. For the latest information, refer to the manual that comes with the driver.

Notes for installing and using the Active USB-COM port driver

- The driver should be installed with administrative permission (Administrator Login).
- The driver does not contain a Microsoft digital signature. Therefore, do not block installation of drivers containing no signature with the driver's signature option or local policy's security option.
- The driver allows hot plugging or unplugging of a USB device even during communication (when the COM port is being opened); however, the communications data when the USB device is disconnected will be lost.
- The driver always serves as a virtual serial port even if a USB device is unplugged, so the driver always occupies a COM port number.
- The driver cannot coexist with conventional Denso USB-COM device drivers in a host computer. In the installation procedure, the Active USB-COM port driver requires uninstalling the conventional ones.
- Installing the driver on a single host computer more than one time enables more than one USB device to be used. However, the uninstaller of the Active USB-COM port driver uninstalls previously installed drivers, not individually but all at once.

Installation procedure

Refer to the installation procedure for "Active USB-COM Port Driver Installation Guide."

3.2.2 Setting up the USB keyboard interface

The USB keyboard interface requires the USB device class driver for HID (Human Interface Device) which is included in Windows 98 or later Operating Systems and whose setup wizard will automatically run. You do not need to install the device driver.

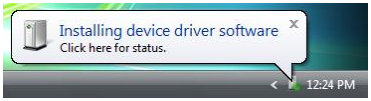
Note: If the USB-COM interface is set up, switch it to the USB keyboard interface by scanning the "USB keyboard interface" QR Code symbol given in Section 12.2 with the parameter setting procedure in Section 12.1. (Plugging the USB interface cable in the scanner automatically switches to the USB-COM interface by default.)

Connecting the USB interface cable to the host's USB port or USB hub automatically runs the system-supplied driver setup wizard. Follow the wizard and set up the driver. This section describes the procedure on each of Windows XP and Windows Vista. On Windows 7 also, follow the wizard.

Windows 7 / Windows Vista

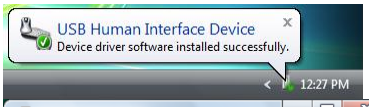
(1) Switch the computer on to run Windows 7 or Windows Vista. Log on as an Administrator.

(2) Connect the scanner's USB interface cable to the computer or USB hub.

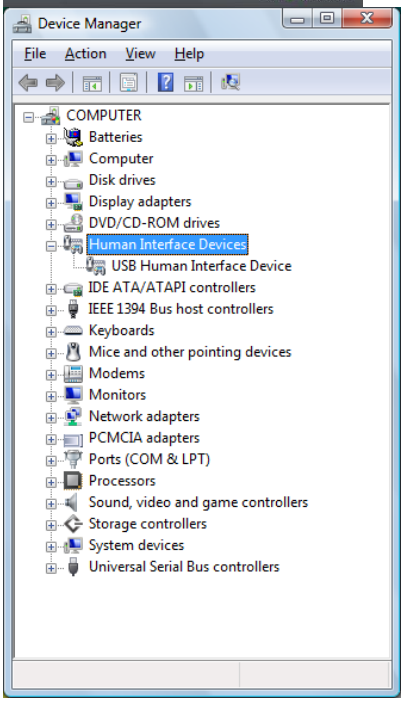


(3) Wait for the Installing device driver software hint to pop up on the Windows task tray.

Windows will automatically configure the scanner. Upon completion of the configuration, the screen shown at left automatically disappears.



(4) Wait for the USB Human Interface Device hint to pop up on the task tray.



(5) To check whether the USB device is working normally, open the Windows Device Manager.

If **USB Human Interface Device** is added to the sub-tree of **Human Interface Devices** as shown at left, the scanner is connected normally.

If the device is not added or it is marked with ! or ×, remove this driver with the uninstaller, reboot your computer, and perform the above connection process again.

Windows XP

(1) Switch the computer on to run Windows XP. Log on as an Administrator.

(2) Connect the scanner's USB interface cable to the computer or USB hub.

(3) Wait for the **Found New Hardware** hint to pop up on the Windows task tray.

Windows will automatically configure the scanner. Upon completion of the configuration, the screen shown at left automatically disappears.

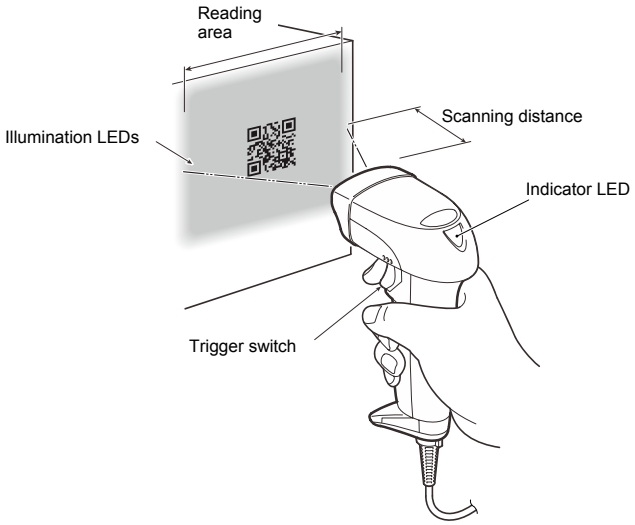
(4) To check whether the USB device is working normally, open Windows Device Manager.

If **USB Human Interface Device** is added to the sub-tree of **Human Interface Devices** as shown at left, the scanner is connected normally.

If the device is not added or it is marked with ! or ×, remove this driver with the uninstaller, reboot your computer, and perform the above connection process again.

(1) Bring the reading window to the target code and press the trigger switch. The marker indicating the approximate center of the reading area irradiated by the illumination LEDs lights up for reading.

Note: This step is not required for the Continuous reading modes 1, 2, Auto sensing mode and Auto stand mode.



(2) Wait for the indicator LED to turn blue and the beeper to sound, indicating a successfully read.

Note: The reading area is made narrower than the illumination LEDs lighting area. The reading area is approx. 2.4" (6 cm) wide by 1.6" (4 cm) high when the scanning distance is approx. 3.1" (8 cm).

Note: The reading area indicated by the illumination LEDs is given only as a guide, and it does not mean that a reading of the code placed inside the illumination LEDs lighting area is guaranteed.

Note: Allow only a single code to come within the field of view except when the multi-line code scanning is allowed. Having more than one code within the field of view either causes the read to fail or produces multiple input.

Note: The double-read prevention enabled time can be specified with the configuration software (ScannerSetting_2D).

Note: The scanner can read codes omnidirectionally. Note that a target code plus its margin should lie within the reading area.

Note: If the scanner fails to read due to specular effects or other factors, change the scanning angle of the reading window or the distance from the codes, and repeat the process. (Specular effects occur when the reflection of the light from the label surface is too strong, such as when the reflecting surface is polished or covered with vinyl.)

■ Scanning mode

Regular read mode	This mode transfers the code data when the scanner has read the code successfully.
Data verification mode	This mode verifies the code data against the master data stored in the scanner. (Refer to Section 7.1 for details.)

Chapter 5 Customizing the Scanner

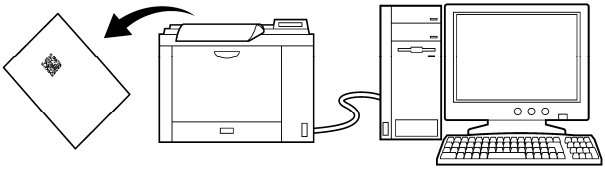
You can customize the scanner by modifying communications, code type, and other scanner parameters with the QR-coded parameter menu or the configuration software ScannerSetting_2D*. These parameters retain their settings even when the power is off.

(1) Scanning parameter setting QR Codes from the **QR-coded parameter menu** by pressing the trigger switch.
(The QR-coded parameter menu is given in Chapter 12.)

(2) Using the **configuration software (ScannerSetting_2D)*** in your computer.

The configuration software is available via the RS-232C interface or USB-COM interface; it is not via the USB keyboard interface.

The configuration software also offers batch-process QR code symbols for read by scanners in the field. Those symbols printed can be scanned by the scanner via any of the RS-232C interface, USB-COM interface and USB keyboard interface.



Note: The configuration software is not available via the USB keyboard interface.

* Registered users can download the configuration software (ScannerSetting_2D) from QBNet, their customer support section on the Denso Wave website at no extra charge.
For further details on QBNet or to register, visit the following URL.
http://www.qbdirect.net

Chapter 6 Scanning Control

Two types of scanning controls are available--Trigger switch control and Software control.

Trigger switch control: Pressing the trigger switch readies the scanner for reading. (Refer to Section 6.1.)

Software control: Instead of pressing the trigger switch, you send control commands from the host computer via the RS-232C or USB-COM interface to ready the scanner for reading or put the scanner on standby. (Refer to Section 6.2.)

In addition, the auto sensing mode and auto stand mode are also available. (Refer to Sections 6.3)

6.1 Trigger Switch Control

Pressing the trigger switch turns on the illumination LEDs and readies the scanner for reading. The scanner supports the following six trigger switch operating modes. Select the one that best meets your needs using the QR-coded parameter menu or the configuration software (ScannerSetting_2D).

(1) Auto-off mode

When the trigger switch is pressed, the scanner is brought to the Active state for approximately 5 seconds.

The scanner automatically returns to the Ready state when reading is successfully completed, or after approximately five seconds elapsed with the trigger switch pressed.

The scanner goes to the Ready state if the trigger switch is released before five seconds elapses.(in the case of normal mode)

When the Auto off mode is set to be active only once (One-shot mode), the time required for the scanner to become the Ready state after the trigger switch was pressed shall be designated in the setting.

(2) Momentary switching mode

The scanner is brought to the Active state only when the trigger switch is pressed, and returns to the Ready state when the trigger switch is released.

(2) Momentary switching mode (Reverse type)

The scanner is brought to the Ready state only when the trigger switch is pressed, and returns to the Active state when the trigger switch is released.

(4) Alternate switching mode

The scanner alternates between the Active state and the Ready state every time the trigger switch is pressed.

(5) Continuous reading mode 1

When you turn the scanner on, the scanner lights the illumination LEDs and becomes ready to scan. The scanner ignores all trigger switch input.

If the scanner receives the Z, READOFF or LOFF command, it switches to standby; if it receives the R, READON or LON command, it becomes ready to scan.

You can select whether or not the scanner transmits the ERROR command when the scanner cannot complete reading and switches to standby, using the configuration software (ScannerSetting_2D).

(6) Continuous reading mode 2

This mode is functionally equivalent to the Continuous Reading mode 1, except that the scanner waits for a command upon completion of reading. To become ready to scan, the scanner should receive the Z, READOFF or LOFF command to switch to standby and then receive the R, READON or LON command.

You can select whether or not the scanner transmits the ERROR command when the scanner cannot complete reading and switches to standby, using the configuration software (ScannerSetting_2D).

Note: When you are setting parameters using the QR-coded parameter menu, the scanner is always in the Auto-off mode regardless of the trigger switch operating mode selected.

6.2 Software Control

You can control the scanner by sending scanning control commands from the host computer via the RS-232C or USB-COM interface, instead of pressing the trigger switch.

Reading control commands include R, READON, LON, Z, READOFF and LOFF and are restricted by the trigger switch operating modes, as listed below.

(√ : Command valid)

Commands	Description	Trigger switch operating modes				
		Auto-off mode	Momentary switching mode	Momentary switching mode (Reverse type)	Alternate switching mode	Continuous reading mode 1 or 2
R, READON, LON	Ready-to-scan commands Upon receipt of one of these commands, the scanner lights the illumination LEDs and becomes ready to scan.	--	--	--	--	√
Z, READOFF, LOFF	Standby commands Upon receipt of one of these commands, the scanner turns off the illumination LEDs and switches to standby.	--	--	--	--	√

Each of these commands should be enclosed with a header and terminator for transmission according to the communications conditions of the scanner.

6.3 Reading by Automatic detection of labels

In auto Sensing mode (Auto sense operation in Auto stand mode is included), bringing a code label within the reading area of the reading window turns on the illumination LEDs and starts the scanner reading the code. No trigger switch operation is required. Use this mode when the scanner is stationary to a stand and a code label is moved.

The illumination LEDs come on when you bring a code label within the designated range or move a code label within the same range. These LEDs go off when a code label is moved away from the range or stays within the range without move for approx. 3 seconds.

In the Auto stand mode, the scanner is set to the Auto sense operation when the power is turned on.

If the trigger switch is pressed while the scanner is operating in this mode, the scanner goes to the Auto off and reads a code whenever the trigger switch is pressed.

However, the scanner will automatically return to the Auto sense operation if the trigger switch is not pressed for longer than a time specified for the scanner to return to the Auto sense.

The time for the scanner to return to the Auto sense operation from the Auto off operation can be selected with the configuration software (ScannerSetting_2D).

Auto sensing mode and Auto stand mode are selected with the QR-coded parameter menu or the configuration software (Scanner Setting_2D).

The scanner offers a choice of three sensitivity levels for responding to codes. Switch to a higher sensitivity level if the illumination LEDs will not come on when a code is brought into the range, for example.

Note: Even if you do not bring a code label within the reading area, the illumination LEDs may come on when the ambient level of light changes or any shadows move within the reading area.

Note: To enable the scanner to work properly in the Auto sensing mode, an ambient illuminance of at least 500 lx is required.

Chapter 7 Scanning Functions

7.1 Data Verification Mode

The Data verification mode verifies the code data read against the master data stored in the scanner and reports the match status with data output.

Data verification read is available in two types--"n-point verification" and "2-point verification," which can be selected with the configuration software (ScannerSetting_2D).

Selecting the n-point verification requires registering master data only one time for 1:n verification. The scanner verifies all code data read after registration against the master data.

The 2-point verification refers to 1:1 verification. Selecting it requires registering master data each time preceding code scanning. After registration of master data, the scanner reads a code, verifies the code data read against the master data and then becomes ready to register new master data. This way, the 2-point verification read alternately repeats master data registration and code scanning.

In n-point verification read, master data can be registered with "preset master registration" or "scan master registration"; in 2-point verification read, with "scan master registration" only. The preset master registration registers master data with the configuration software (ScannerSetting_2D) beforehand, and the scan master registration, by scanning a master code label.

The master data registered by "preset master registration" or "scan master registration" will be sent to the host computer when you scan the "Output master data" code given on page 16.

The verification parameters can be specified with the configuration software (ScannerSetting_2D).

7.1.1 Data verification read procedure

■ n-point verification

Preset master registration

This is available only when n-point verification is selected. Register the code type and data to be used for verification using the configuration software (ScannerSetting_2D). Up to 99 digits can be registered.

The registered master data will be preserved even if the scanner is turned off. To clear it, first clear the registered master data stored in the host computer with the configuration software (ScannerSetting_2D) and then send the new setting data to the scanner.

Scan master registration

1) Switch the scanner to the Data Verification mode and select the RS-232C or USB-COM interface.
2) Send a scan entry control command "E" from the host to the scanner. (Refer to Appendix 2 for control commands.) The indicator LED lights in green.
3) Use the scanner to scan a master code to be registered. (The scanner operates in the trigger switch operating mode currently set.) After registration of master data, the indicator LED turns blue and then goes OFF.
4) Use the scanner to scan a target code. The scanner verifies the code read against the master data registered and then outputs the result. After a successful read, the indicator LED lights in blue.

During the registration operation above, if the master data has fewer characters than specified (e.g., less than the specified verification start position), the registration operation aborts with an error.

Even if "Preset master registration" has been made, you can make "Scan master registration." If both have been made, the number of characters to verify that has been specified with "Preset master registration" and the master data that has been specified with "Scan master registration" will be valid.

Note: The registered master data will be cleared when you customize the scanner by modifying the parameters with the configuration software (ScannerSetting_2D) or a batch-process QR code symbol.

Note: If no master data has been entered by either "Preset master registration" or "Scan master registration," the indicator LED flashes in red, during which it is impossible to scan codes.

Note: When the USB keyborad interface is used in the n-point Verification mode, the n-point Verification is disabled and the normal reading mode is automatically selected if preset registered data is not present.

■ 2-point verification

Scan master registration

1) Switch the scanner to the Data verification mode and select the RS-232C or USB-COM interface. The indicator LED lights in green.
2) Use the scanner to scan a master code to be registered. (The scanner operates in the trigger switch operating mode currently set.) After the registration of master data, the indicator LED turns blue and then goes OFF.
3) Use the scanner to scan a target code. The scanner verifies the code read against the master data registered and then outputs the result.

   After a successful read, the indicator LED lights in blue and then turns green, indicating that the scanner is ready to register *new* master data.

During the registration procedure above, if the master data has fewer characters than specified (e.g., less than the specified verification start position), the registration operation aborts with an error. The scanner becomes ready to register master data again.

Verification retry after mismatch in 2-point verification

The 2-point verification read provides the "Verification retry after mismatch" option that retries verification against the *same* master data. Enabling this option with the configuration software (ScannerSetting_2D) readies the scanner not for registering *new* master data but for reading a bar code again if the verification result is a mismatch.

Disabling this option readies the scanner for registering *new* master data after bar code reading, no matter what the verification result is.

Note: Any of the following events clears the master data stored in the scanner.
- Turning the scanner power off.
- Modifying the verification start position or the number of characters to verify.
- Customizing the scanner by modifying the parameters with the configuration software (ScannerSetting_2D) or by scanning a batch-process OR code symbol.

Note: The Data verification area can be selected from "Code type + code data" or "Code data only" with the configuration software (ScannerSetting_2D).

7.1.2 Specifying a verification object

You can specify two types of verification objects--data string and data block. For data string verification, specify the verification start position and the number of characters to be verified. For data block verification, specify one of the data blocks delimited by commas in the CSV format.

(1) Data string verification

The scanner verifies data specified by the verification start position and the number of characters to be verified against the master data registered in the scanner, and then it outputs the verification result.

The verification start position should be within the range of 1 to 999, and the number of characters* to be verified, within the range of 1 to 99.

*The number of characters for Code 39 and Codabar (NW-7) symbols should be specified including start and stop codes.

In any of the following cases, the verification results in a mismatch:

1) The verification data in the specified position does not match the master data.
2) The code type which the verification data belongs to is different from the one which the master data belongs to. See **(Note)** below.
3) All data specified is not included or no data is included within the specified range.

(Examples)

Master data registered	Verification start position	No. of characters to be verified	Data string read (Verification object)	Result
345	3	3	00**345**	Match
345	3	3	00**345**678	Match
345	3	3	00**34**6	Mismatch
345	3	3	00**34**	Mismatch

(2) Data block verification

If data is saved in the comma-delimited CSV format, the scanner verifies data in the specified data block against the master data registered in the scanner, and then outputs the verification result.

The data block position should be within the range of 1 to 99.

In any of the following cases, the verification results in a mismatch:

1) The verification data in the specified block does not match the master data.
2) The code type which the verification data belongs to is different from the one which the master data belongs to. See **(Note)** below.
3) All data specified is not included or no data is included within the specified block.
4) The data block to be verified exceeds 99 characters in length.

(Examples)

Master data registered	Position of data block to be verified	Data block read (Verification object)	Result
345	3	0,12,**345**,6789	Match
345	3	0,12,**34**6,6789	Mismatch
345	3	0,12,**345**6,6789	Mismatch
345	3	0,12,**34**,6789	Mismatch
345	3	0,12	Mismatch

(Note) Whether the code ID mark is matched or not is determined not by the combination of code ID marks Type 1 and Type 2 but by Type 1 only (refer to Chapter 9, Section 9.4).

7.1.3 Verification result output

(1) Report of match/mismatch status

You can select any of the following report types using the configuration software (ScannerSetting_2D). Selecting "Disable transmission" reports nothing.

Setting	If there is a match:	If there is a mismatch:
1	Disable transmission.	Disable transmission.
2	Enable code data transmission.	Enable code data transmission.
3	Enable OK transmission.	Enable NG transmission.

(2) Beeper and indicator LED

You can check whether the verification result is a match or mismatch with the beeper and indicator LED.

When the beeper and indicator LED are enabled, they act as shown below.

	Beeper	Indicator LED
If there is a match:	Emits a short beep.	Lights in blue.
If there is a mismatch:	Emits a long beep.	Lights in red.

Output of the master data registered

Scanning the "Output master data" code given below lets the scanner output the verification section of master data entered in the Data verification read procedure, together with the code ID mark.

"Output master data" code

7.2 Editing Data

You can edit and output code data read, in any of the four data edit modes--"data extraction mode," "data substitution mode," "data blocksorting mode" and "ADF script mode." These data edit modes can be selected with the configuration software (ScannerSetting_2D). The default is "No editing."

Note: In the case of multi-line bar codes, unless all code ID marks read are matched, the data editing processing will result in an error regardless of whether or not the data read contains any error. Whether the code ID mark is matched is determined not by the combination of code ID marks but by Type 1 only (refer to Chapter 9, Section 9.4).

Note: In the case of Structured Appended QR (iQR) Code, the scanner in edit mode or batch edit mode performs data editing processing upon completion of scanning of all split Code symbols; in non-edit mode, it performs each time a single split Code symbol is read.

7.2.1 Data extraction mode

This mode offers three extraction choices--"data string," "data block" and "AI (Application Identifier)-prefixed string" extractions from code data read and then outputs it.

The "data block" extraction is available only when code data is in the comma-delimited CSV format. The "AI-prefixed string" extraction is available for GS1-128 (EAN-128), GS1 DataBar (RSS), and EAN.UCC Composite symbols (excluding linear components in a UPC/EAN Composite symbol).

7.2.1.1 Extracting a data string

The scanner extracts a data string specified by the "Extraction start position" and "Extraction end position" from a code specified by the "Code type" and then outputs it in the data transmission format selected in the scanner (see Chapter 9, Section 9.4). The extraction conditions and extraction start and end positions are listed below.

■ Extraction conditions

Extraction conditions	Choices
"Code type"	Any code
	QR Code
	iQR Code
	PDF417
	Data Matrix
	MaxiCode
	Aztec
	UPC-A/EAN-13
	UPC-E
	EAN-8
	Code 128
	GS1-128 (EAN-128)
	Codabar (NW-7)
	Code 39
	Code 93
	Interleaved 2of5 (ITF)
	Standard 2of5 (STF)
	GS1 DataBar (RSS)
	EAN.UCC Composite symbology
"Data transfer regardless of error result"	Permit/Prohibit

If the scanner fails to extract a data string or scans a code not specified by "Code type" when the "Data transfer regardless of error result" is permitted, then it outputs the data read as is without editing.

■ Extraction start and end positions

"Extraction start position"	"Extraction end position"
Head position	*n*th position
Tail position	
*n*th position	Tail position
	By *n* positions from the start position
	*n*th position

The *n* can be 1 through 9999. Note that if the extraction start position is specified as *n*th position, the extraction end position should be equal to or greater than the extraction start position.

Note: The number of characters for Code 39 and Codabar (NW-7) symbols should be specified including start and stop codes.

Example Code read: QR Code, Data: 12345,
Header: STX, Terminator: ETX, Scanner ID: Disable, Code ID mark: Type 1,
Transmission of the number of digits: Enable, Prefix/Suffix: None, BCC: Disable

Extraction conditions	Extraction start position	Extraction end position	Output data
"Code type": QR Code "Data transfer regardless of error result": Prohibit	Head position	3rd position	[STX]Q0003123[ETX]
	Tail position	3rd position	[STX]Q0003345[ETX]
	1st position	Tail position	[STX]Q000512345[ETX]
	1st position	By 3 positions	[STX]Q0003123[ETX]
	2nd position	4th position	[STX]Q0003234[ETX]
	Head position	6th position	Error
	Tail position	6th position	Error
	6th position	Tail position	Error
	6th position	By 10 positions	Error
	1st position	6th position	Error
"Code type": QR Code "Data transfer regardless of error result": Permit	Head position	6th position	[STX]Q000512345[ETX]
	Tail position	6th position	[STX]Q000512345[ETX]
	6th position	Tail position	[STX]Q000512345[ETX]
	6th position	By 10 positions	[STX]Q000512345[ETX]
	1st position	6th position	[STX]Q000512345[ETX]
"Code type": PDF417 "Data transfer regardless of error result": Prohibit	Invalid if specified.	Invalid if specified.	Error
"Code type": PDF417 "Data transfer regardless of error result": Permit	Invalid if specified.	Invalid if specified.	[STX]Q000512345[ETX]

7.2.1.2 Extracting data blocks

If data read is in the comma-delimited CSV format, the scanner extracts data blocks specified by the data block numbers from a code specified by the “Code type” and then outputs it in the data transmission format selected in the scanner (see Chapter 9, Section 9.4). The extraction conditions and data bock numbers are listed below.

■ Extraction conditions

Extraction conditions	Choices
“Code type”	Any code
	QR Code
	iQR Code
	PDF417
	Data Matrix
	MaxiCode
	Aztec
	UPC-A/EAN-13
	UPC-E
	EAN-8
	Code 128
	GS1-128 (EAN-128)
	Codabar (NW-7)
	Code 39
	Code 93
	Interleaved 2of5 (ITF)
	Standard 2of5 (STF)
	GS1 DataBar (RSS)
	EAN.UCC Composite symbology
“Data transfer regardless of error result”	Permit/Prohibit

If the scanner fails to extract a data block or scans a code not specified by “Code type” when the “Data transfer regardless of error result” is permitted, then it outputs the data read as is without editing.

■ Data block numbers

Each data block number should be within the range from 1 through 99. Up to three blocks can be extracted.

Example Code read: QR Code, Data: (See the table below.)
Header: STX, Terminator: ETX, Scanner ID: Disable, Code ID mark: Disable,
Transmission of the number of digits: Disable, Prefix/Suffix: None, BCC: Disable

Extraction conditions	Data read	Data block numbers	Output data
“Code type”: QR Code “Data transfer regardless of error result”: Prohibit	1,23,456,7890	1, 2 and 3	[STX]1[ETX][STX]23[ETX][STX]456[ETX]
	1,23,456,7890	3, 1 and 2	[STX]456[ETX][STX]1[ETX][STX]23[ETX]
	1234567890	1	[STX]1234567890[ETX]
	1,,23,456,7890	2 and 5	[STX][ETX][STX]7890[ETX]
	1,23,456,7890	5	Error
	1,23,456,7890	4 and 5	Error
	1234567890	1 and 2	Error
“Code type”: QR Code “Data transfer regardless of error result”: Permit	1,23,456,7890	5	[STX]1,23,456,7890[ETX]
	1,23,456,7890	4 and 5	[STX]1,23,456,7890[ETX]
	1234567890	1 and 2	[STX]1234567890[ETX]
“Code type”: PDF417 “Data transfer regardless of error result”: Prohibit	1,23,456,7890	Invalid if specified.	Error
“Code type”: PDF417 “Data transfer regardless of error result”: Permit	1,23,456,7890	Invalid if specified.	[STX]1,23,456,7890[ETX]

7.2.1.3 Extracting AI (Application Identifier)-prefixed strings

If the scanner reads any of GS1-128 (EAN-128), GS1 DataBar (RSS), and EAN.UCC Composite symbols (excluding linear components in a UPC/EAN Composite symbol), it edits the data according to AIs and outputs it in the data transmission format selected in the scanner (see Chapter 9, Section 9.4).

The "AI-prefixed string" extraction is available in two modes--AI-delimited mode and AI parenthesizing mode. AIs to be used for data editing are listed in (3) AI table later.

(1) AI-delimited mode

In this mode, the scanner extracts strings prefixed with AIs specified (up to three types of AIs) and separates them with the specified delimiters (selectable from headers/terminators, commas and tabs) instead of AIs to output them.

■ Extraction conditions

Extraction conditions	Choices
"Data transfer regardless of error result"	Permit/Prohibit

If the scanner fails to extract an AI-prefixed string when the "Data transfer regardless of error result" is permitted, it outputs the data read as is without editing.

■ Delimiters

Delimiters can be any of the following three--header/terminator, comma and tab.

- Header/terminator

  Specifying a header/terminator as delimiters prefixes a header and suffixes a terminator to each element string separated.

  A scanner ID, code ID mark, the number of digits, prefix, and suffix can be also added to each element string if their transmissions are enabled. The number of digits is the count of each element string edited.

  Example Data read: (01)94901234567894(11)030808(13)030810
  Header: STX, Terminator: ETX, Scanner ID: Disable, Code ID mark: Disable,
  Transmission of the number of digits: Enable, Prefix/Suffix: None, BCC: Disable

AIs specified	Output data
01,11,13	[STX]0014940123456789 4[ETX][STX]0006030808[ETX][STX]0006030810[ETX]

- Comma

  Specifying a comma as delimiters outputs comma-delimited data. No comma follows the tail of the data.

  A header and terminator are added to the full string. None of a scanner ID, code ID mark, the number of digits, prefix, and suffix is added even if their transmissions are enabled.

  Example Data read: (01)94901234567894(11)030808(13)030810
  Header: STX, Terminator: ETX, Scanner ID: Disable, Code ID mark: Disable,
  Transmission of the number of digits: Disable, Prefix/Suffix: None, BCC: Disable

AIs specified	Output data
01,11,13	[STX]94901234567894,030808,030810[ETX]

- Tab (ASCII 09H (HT))

  Specifying a tab as delimiters outputs tab-delimited data. No tab follows the tail of the data.

  A header and terminator are added to the full string. None of a scanner ID, code ID mark, the number of digits, prefix, and suffix is added even if their transmissions are enabled.

  Example Data read: (01)94901234567894(11)030808(13)030810
  Header: STX, Terminator: ETX, Scanner ID: Disable, Code ID mark: Disable,
  Transmission of the number of digits: Disable, Prefix/Suffix: None, BCC: Disable

AIs specified	Output data
01,11,13	[STX]94901234567894[TAB]030808[TAB]030810[ETX]

Example Data read: (01)94901234567894(11)030808(13)030810(17)040208(17)040305
Header: STX, Terminator: ETX, Scanner ID: Disable, Code ID mark: Disable,
Transmission of the number of digits: Disable, Prefix/Suffix: None, BCC: Disable

Extraction conditions	AIs specified	Delimiter	Output data
"Data transfer regardless of error result": Prohibit	01,11,17	Comma	[STX]94901234567894,030808,040208[ETX]
	17,11		[STX]040208,030808[ETX]
	17,17		[STX]040208,040305[ETX]
	12		Error
	01,12		Error
	01,01		Error
	01,11,17		[STX]94901234567894,030808,040208[ETX]
"Data transfer regardless of error result": Permit	17,11		[STX]040208,030808[ETX]
	17,17		[STX]040208,040305[ETX]
	12		[STX]0194901234567894110308081303081017040208170 4020817040305[ETX]
	01,12		
	01,01		

(Note 1) Element strings will be output in the order of AIs specified.

(Note 2) If data read contains two or more element strings prefixed with the same AI, those element strings will be output in the order arranged in that data read.

(Note 3) If data read does not contain a string prefixed with the specified AI or it contains such data but its number of digits is more or less than the one defined for that AI, an error will result when the "Data transfer regardless of error result" is prohibited.

(2) AI parenthesizing mode

In this mode, the scanner parenthesizes AIs contained in data read and outputs the edited data according to the extraction conditions.

■ Extraction conditions

Extraction conditions	Choices
"Data transfer regardless of error result"	Permit/Prohibit

If the scanner fails to extract an AI-prefixed element string when the "Data transfer regardless of error result" is permitted, it outputs the data read as is without editing.

Example Header: STX, Terminator: ETX, Scanner ID: Disable, Code ID mark: Disable,
Transmission of the number of digits: Disable, Prefix/Suffix: None, BCC: Disable

Extraction conditions	Data read	Output data
"Data transfer regardless of error result": Prohibit	01949012345678941103080813030 81017040208	[STX](01)94901234567894(11)030808(13)03 0810(17)040208[ETX]
	01949012345678941103080813030 810617040208170403 05	Error (Note 1)
"Data transfer regardless of error result": Permit	01949012345678941103080813030 81017040208	[STX](01)94901234567894(11)030808(13)03 0810(17)040208[ETX]
	01949012345678941103080813030 810617040208170403 05	[STX]01949012345678941103080813030 810617040208170403 05[ETX]

(Note 1) Data from the head to element string 030810 prefixed with AI (13) can be normally extracted, but the following data (as underlined below) causes an error since it starts with 6 that cannot start any AI.

(01)94901234567894(11)030808(13)030810617040208170403 05

(3) AI table

In the AI-prefixed string extraction, the scanner edits data according to the Application Identifiers (AIs) defined below.

AI	Format	Description
00	n2+n18	Serial Shipping Container Code (SSCC)
01	n2+n14	Global Trade Item Number (GTIN)
02	n2+n14	GTIN of Trade Items Contained in a logistic unit (For Use with AI 37 Only)
03	n2+n14	Reserved.
04	n2+n16	Reserved.
10	n2+an..20	Batch or Lot Number
11	n2+n6	Production Date (YYMMDD) (*)
12	n2+n6	Due Date (YYMMDD) (*)
13	n2+n6	Packaging Date (YYMMDD) (*)
15	n2+n6	Best Before Date (YYMMDD) (*)
17	n2+n6	Expiration Date (YYMMDD) (*)
20	n2+n2	Product Variant
21	n2+an..20	Serial Number
22	n2+an..29	HIBCC (Health Industry Business Communication Council)--Quantity, Date, Batch, and Link
23n	n3+n..19	Batch or Lot Number (Transitional Use) (**)
240	n3+an..30	Additional Product Identification Assigned by the Manufacturer
241	n3+an..30	Customer Part Number
250	n3+an..30	Secondary Serial Number
251	n3+an...30	Reference to Source Entity
252	n3+n27	Global Serial Number
30	n2+n..8	Quantity
310n	n4+n6	Net Weight, Kilograms
311n	n4+n6	Length or 1st Dimension, Meters
312n	n4+n6	Width, Diameter, or 2nd Dimension, Meters
313n	n4+n6	Depth, Thickness, Height, or 3rd Dimension, Meters
314n	n4+n6	Area, Square Meters (***)
315n	n4+n6	Volume, Liters (***)
316n	n4+n6	Volume, Cubic Meters (***)
320n	n4+n6	Net Weight, Pounds (***)

AI	Format	Description
321n	n4+n6	Length or 1st Dimension, Inches (***)
322n	n4+n6	Length or 1st Dimension, Feet (***)
323n	n4+n6	Length or 1st Dimension, Yards (***)
324n	n4+n6	Width, Diameter, or 2nd Dimension, Inches (***)
325n	n4+n6	Width, Diameter, or 2nd Dimension, Feet (***)
326n	n4+n6	Width, Diameter, or 2nd Dimension, Yards (***)
327n	n4+n6	Depth, Thickness, Height, or 3rd Dimension, Inches (***)
328n	n4+n6	Depth, Thickness, Height, or 3rd Dimension, Feet (***)
329n	n4+n6	Depth, Thickness, Height, or 3rd Dimension, Yards (***)
330n	n4+n6	Gross Weight, Kilograms (***)
331n	n4+n6	Length or 1st Dimension, Meters, Logistics (***)
332n	n4+n6	Width, Diameter, or 2nd Dimension, Meters, Logistics (***)
333n	n4+n6	Depth, Thickness, Height, or 3rd Dimension, Meters, Logistics (***)
334n	n4+n6	Area, Square Meters, Symbology (***)
335n	n4+n6	Gross Volume, Liters (***)
336n	n4+n6	Gross Volume, Cubic Meters (***)
337n	n4+n6	Kilograms per Square Meter (pressure) (***)
340n	n4+n6	Gross Weight, Pounds (***)
341n	n4+n6	Length or 1st Dimension, Inches, Logistics (***)
342n	n4+n6	Length or 1st Dimension, Feet, Logistics (***)
343n	n4+n6	Length or 1st Dimension, Yards, Logistics (***)
344n	n4+n6	Width, Diameter, or 2nd Dimension, Inches, Logistics (***)
345n	n4+n6	Width, Diameter, or 2nd Dimension, Feet, Logistics (***)
346n	n4+n6	Width, Diameter, or 2nd Dimension, Yards, Logistics (***)
347n	n4+n6	Depth, Thickness, Height, or 3rd Dimension, Inches, Logistics (***)
348n	n4+n6	Depth, Thickness, Height, or 3rd Dimension, Feet, Logistics (***)
349n	n4+n6	Depth, Thickness, Height, or 3rd Dimension, Yards, Logistics (***)
350n	n4+n6	Area, Square Inches (***)
351n	n4+n6	Area, Square Feet (***)
352n	n4+n6	Area, Square Yards (***)
353n	n4+n6	Area, Square Inches, Logistics (***)
354n	n4+n6	Area, Square Feet, Logistics (***)

AI	Format	Description
355n	n4+n6	Area, Square Yards, Logistics (***)
356n	n4+n6	Net Weight, Troy Ounces (***)
357n	n4+n6	Net Volume, Ounces (***)
360n	n4+n6	Volume, Quarts (***)
361n	n4+n6	Volume, Gallons (***)
362n	n4+n6	Gross Volume, Quarts (***)
363n	n4+n6	Gross Volume, Gallons (***)
364n	n4+n6	Volume, Cubic Inches (***)
365n	n4+n6	Volume, Cubic Feet (***)
366n	n4+n6	Volume, Cubic Yards (***)
367n	n4+n6	Gross Volume, Cubic Inches (***)
368n	n4+n6	Gross Volume, Cubic Feet (***)
369n	n4+n6	Gross Volume, Cubic Yards (***)
37	n2+n..8	Quantity (For Use with AI 02 Only)
390n	n4+n15	Amount Payable--Single Monetary Area
391n	n4+n3+n15	Amount Payable and ISO Currency Code
392n	n4+n15	Amount Payable for a Variable Measure Trade Item--Single Monetary Area
393n	n4+n3+n15	Amount Payable for a Variable Measure Trade Item and ISO Currency Code
400	n3+an..30	Customer's Purchase Order Number
401	n3+an..30	Consignment Number
402	n3+n17	Shipment Identification Number
403	n3+an..30	Routing Code
410	n3+n13	Ship to (Deliver to) EAN.UCC Global Location Number
411	n3+n13	Bill to (Invoice to) EAN.UCC Global Location Number
412	n3+n13	Purchased from EAN.UCC Global Location Number
413	n3+n13	Ship for (Deliver for) EAN.UCC Global Location Number
414	n3+n13	Identification of a Physical Location--EAN.UCC Global Location Number
415	n3+n13	EAN.UCC Global Location Number of the Invoicing Party
420	n3+an..20	Ship to (Deliver to) Postal Code Within a Single Postal Authority
421	n3+n3+an..9	Ship to (Deliver to) Postal Code with Three-Digit ISO Country Code Prefix
422	n3+n3	Country of Origin of a Trade Item

AI	Format	Description
423	n3+n15	Country of Initial Processing
424	n3+n3	Country of Processing
425	n3+n3	Country of Disassembly
426	n3+n3	Country of Final Processing
43	n2+n4+n7+an..10+n1	Carrier Assigned Tracking Number
7001	n4+n13	NATO Stock Number (NSN)
7002	n4+an..30	UN/ECE Meat Carcasses and Cuts Classification
7003	n4+n10	Effective term (YYMMDDHHMM)
7030	n4+n3+an..27	Approval Number of Processor with Three-Digit ISO Country Code, Butchery
7031	n4+n3+an..27	Approval Number of Processor with Three-Digit ISO Country Code, 1st Processing Place
703n	n4+n3+an..27	Approval Number of Processor with Three-Digit ISO Country Code, 2nd to 9th Processing Places
8001	n4+n14	Roll Products--Width, Length, Core Diameter, Direction, and Splices
8002	n4+an..20	Cellular Mobile Telephone Identifier
8003	n4+n14+an..16	EAN.UCC Global Returnable Asset Identifier (GRAI)
8004	n4+an..30	EAN.UCC Global Individual Asset Identifier (GIAI)
8005	n4+n6	Price Per Unit of Measure
8006	n4+n14+n2+n2	Identification of the Component of a Trade Item
8007	n4+an30	International Bank Account Number (IBAN)
8008	n4+n6+n6	Date and Time of Production (YYMMDDHHMMSS)
8018	n4+n18	EAN.UCC Global Service Relation Number (GSRN)
8020	n4+an25	Payment Slip Reference Number
8100	n4+n1+n5	UPC Coupon Extended Code--Number System Character and Offer Code
8101	n4+n1+n5+n4	UPC Coupon Extended Code--Number System Character, Offer Code, and End of Offer Code
8102	n4+n1+n1	UPC Coupon Extended Code--Number System Character Preceded by Zero
90	n2+an..30	FACT Data Identifiers
91	n2+an..30	Company Internal Information--Company
92	n2+an..30	Company Internal Information--Company
93	n2+an..30	Company Internal Information--Company
94	n2+an..30	Company Internal Information--Company

AI	Format	Description
95	n2+an..30	Company Internal Information--Carrier
96	n2+an..30	Company Internal Information--Carrier
97	n2+an..30	Company Internal Information--Company
98	n2+an..30	Company Internal Information--Company
99	n2+an..30	Company Internal Information

(*) To indicate only year and month, DD must be filled with “00.”

(**) n indicates the length of data.

(***) n indicates the decimal point position.

a	Alphabetic characters
a3	3 alphabetic characters, fixed length
a..3	Up to 3 alphabetic characters
n	Numeric characters
n3	3 numeric characters, fixed length
n..3	Up to 3 numeric characters
an	Alphanumeric characters
an3	3 alphanumeric characters, fixed length
an..3	Up to 3 alphanumeric characters

(Note 1) If the specified AI is variable in length and the number of digits in data read is less than the maximum number of digits defined for the AI, then the output contains data read up to a GS (1Dh).

7.2.2 Data substitution mode

If the scanner reads a code specified by the “Code type” in this mode, it searches the data read for the specified string (max. 16 ASCII characters), substitutes it with the specified substitution string (max. 16 ASCII characters), and outputs it in the data transmission format selected in the scanner (see Chapter 9, Section 9.4).

■ Substitution conditions

Substitution conditions	Choices
“Code type”	Any code
	QR Code
	iQR Code
	PDF417
	Data Matrix
	MaxiCode
	Aztec
	UPC-A/EAN-13
	UPC-E
	EAN-8
	Code 128
	GS1-128 (EAN-128)
	Codabar (NW-7)
	Code 39
	Code 93
	Interleaved 2of5 (ITF)
	Standard 2of5 (STF)
	GS1 DataBar (RSS)
	EAN.UCC Composite symbology
Search string and substitution string	Max. 16 ASCII characters (00h to FFh) each

Example Code read: PDF417, Data: 12345678,
Header: STX, Terminator: ETX, Scanner ID: Disable, Code ID mark: Disable,
Transmission of the number of digits: Disable, Prefix/Suffix: None, BCC: Disable

Substitution condition	Search string and Substitution string	Output data
“Code type”: PDF417	2 → A 4 → B	[STX]1A3B5678[ETX]

7.2.3 Data blocksorting mode

The scanner splits code data read into a maximum of 5 blocks at the specified split positions, sorts those blocks in the specified order, and outputs it in the data transmission format selected in the scanner (see Chapter 9, Section 9.4).

Note: The split position must be specified by the number of digits from the head of code data read. Specifying the number of digits exceeding that in the code data results in an error.

■ Blocksorting conditions

Blocksorting conditions	Choices
"Code type"	Any code
	QR Code
	iQR Code
	PDF417
	Data Matrix
	MaxiCode
	Aztec
	UPC-A/EAN-13
	UPC-E
	EAN-8
	Code 128
	GS1-128 (EAN-128)
	Codabar (NW-7)
	Code 39
	Code 93
	Interleaved 2of5 (ITF)
	Standard 2of5 (STF)
	GS1 DataBar (RSS)
	EAN.UCC Composite symbology

Example Code read: Code 128, Data: 1234567890,
Header: STX, Terminator: ETX, Scanner ID: Disable, Code ID mark: Disable,
Transmission of the number of digits: 4 digits, Prefix/Suffix: None, BCC: Disable

Split position	Order of blocks	Output data
3rd position, 8th position	Block 2, 1, 3	[STX]K00104567812390[ETX]
3rd position, 8th position	Block 1, 3	[STX]K000512390[ETX]

7.2.4 ADF script mode

The ADF script refers to a simple program language designed for editing of data read. It enables the following functions.

(1) Extracting data that is fixed or variable in length

(2) Supporting Application Identifiers (AIs) in GS1-128 (EAN-128), GS1 DataBar (RSS) and EAN.UCC Composite symbols

(3) Sorting data blocks into the specified order

(4) Collating data for verification

(5) Outputting same data repeatedly

(6) Performing four arithmetic operations including residue calculation, e.g., transformation of units

(7) Substituting data

(8) Comparing character strings

(9) Driving indicator LED and beeper

The ADF script mode can be programmed with the configuration software (ScannerSetting_2D). To configure the scanner with the ADF script, transfer the script to the scanner or generate an ADF script QR code symbol with the configuration software (ScannerSetting_2D) and use the scanner to read the symbol.

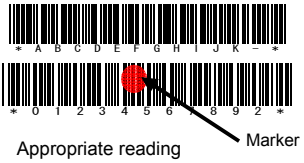
For the specifications and instructions for use of the ADF script, refer to the ADF Script User's Guide.

Note: The ADF script mode cannot be used together with any of other edit modes (data extraction mode, data substitution mode, and data blocksorting mode).

7.3 Point Scan Mode

In the point scan mode, you can aim at a target code by matching up the marker with that code.

If there is no code at the market or the scanner cannot detect the marker due to high levels of ambient lighting, the scanner cannot read anything. Make sure that the marker is actually pointing at the center of the code when scanning. If the marker is positioned over the area spanning the two codes, the scanner may alternately read these two codes.



Appropriate reading

Inappropriate reading

7.4 Scanning a Mirror Image 2D Code

If you enable the mirror image scanning with the configuration software (ScannerSetting_2D), the scanner can scan a mirror image 2D code as well as a normal image. Note that when the mirror image scanning is enabled, the time required for scanning may increase.

7.5 Scanning a Black-and-white Inverted Code

The scanner usually scans a black-and-white normal code (black cells/bars on a white background). You can switch the scanner to scan a black-and-white inverted code (white cells/bars on a black background) or to scan both types of codes while automatically identifying them, using the QR-coded parameter menu or the configuration software (ScannerSetting_2D).

Note that the automatic detection scanning may take more time than normal code or inverted code scanning.

A black-and-white inverted code requires a black quiet zone of more than the number of cells defined in the code specifications.

7.6 Scanning Structured Appended QR (iQR) Code Symbols

QR Code symbology can split data into a maximum of 16 blocks and encode each of them into a Structured Appended QR Code symbol (model 1 or 2) or Structured Appended iRQ Code symbol. Structured Appended Code scanning is possible only with the same Code model.

The scanner can scan Structured Appended Code symbols and restore them to the original data string in edit mode, batch edit mode, and non-edit mode, which you can select using the QR-coded parameter menu or configuration software (ScannerSetting_2D).

Edit mode

The scanner accumulates and edits Structured Appended Code symbols read and then sends the edited data to the host computer. If the total data volume of Structured Appended Code symbols exceeds 8 kilobytes, a read error will result and the accumulated data will be discarded.

Batch edit mode (for QR Code Model 1 and Model 2 only)

If all the Structured Appended Code symbol which is split in less than four to be scanned lie within the readable area, the scanner reads them all once and then edits and sends them to the host computer.

Non-edit mode

Each time a single split Code symbol is read, the scanner sends the data read to the host computer.

When scanning Structured Appended Code symbols, the scanner beeps in a different way from usual. That is, when the scanner reads the first split code, it beeps twice and enters the Structured Appended Code scanning mode. When the scanner completes the sequence of scanning, it beeps three times.

Note: If you scan any non-split QR(iQR) Code symbol or a code other than a QR(iQR) Code symbol midway through a sequence of Structured Appended Code scanning, the scanner cancels the Structured Appended Code scanning, discards the Structured Appended Code data already scanned, and sends the code scanned last.

Note: If the scanner switches to standby in the Auto-off mode (after approx. 5 seconds of holding down the trigger switch or by releasing the trigger switch within 5 seconds) or the Structured Appended Code scanning interval exceeds approx. 3 seconds in any trigger switch operating mode except Auto-off mode, then the scanner discards the data scanned and cancels the Structured Appended Code scanning sequence.

Note: If you scan a Structured Appended Code symbol of any other Code before completion of the current scanning sequence, the scanner discards the data already scanned and starts a new scanning sequence.

7.7 Multi-line Barcode Scanning

The scanner can scan up to 3 lines of bar codes in the readable area at any one time. You can specify the number of lines to be scanned, the data output order and output format using the configuration software (ScannerSetting_2D).*

7.7.1 Number of lines

The number of lines allowed for multi-line barcode scanning is 2 or 3. This setting is essential.

7.7.2 Data output order

You can specify the data output order by designating code types*[1], heading characters*[2], or the number of digits to be scanned*[3].

*1 Code types should be selected from readable bar codes you enable. This setting is essential.

*2 Up to two heading characters can be specified. If a question mark (?) is specified, it acts as a wild card. This setting can be omitted.

*3 The number of digits to be scanned varies depending upon the code type. This setting is essential.

Note: The number of characters for Code 39 symbols should be specified including start and stop codes.

7.7.3 Output format

You can select either the header/terminator- or comma-delimited output format.

(1) Header/terminator-delimited output format

Specifying this format allows the scanner to output multiple lines of barcode data in succession in the data transmission format selected (see Section 9.4) so that the headers and terminators act as delimiters. For UPC and EAN codes, the number of digits will be omitted.

(2) Comma-delimited output format

Specifying this format allows the scanner to output multiple lines of barcode data delimited with commas in the data transmission format selected (see Section 9.4). Note that the scanner outputs the code ID mark specified for the first line barcode and the number of digits including the delimiter commas. The number of digits will not be omitted even for UPC and EAN codes.

Note 1: Bar code types specified for multi-line barcode scanning cannot be read individually.

Note 2: In the point scan mode, the scanning conditions specified for multi-line barcode scanning are invalid so that the scanner scans barcodes individually.

Note 3: The scanner cannot read multi-line barcodes of UPC/EAN with add-on.

Note 4: If linear components in a UPC/EAN Composite symbol are specified for multi-line barcode scanning, EAN.UCC Composite symbols including the specified linear components cannot be read.

7.8 Scanning an SQRC (Security QR Code) Symbol

An SQRC symbol refers to a security QR Code symbol that consists of public and nonpublic data. The nonpublic data can be read only when the encryption key configured in the scanner matches the one in the SQRC symbol.

To read an SQRC symbol with the scanner, it is necessary to enable SQRC scanning (“SQRC symbols only” or “both SQRC symbols and QR Code symbols”) using the configuration software (ScannerSetting_2D). The following SQRC related parameters can be also specified--“Data transmission after mismatch of encryption key,” “Management of encryption key,” and “Data transmission of nonpublic data.”

Note: SQRC scanning requires configuring an encryption key beforehand with the SQRC configuration software (SQRC Setting) separately prepared.

Chapter 8 Beeper, Indicator LED, Marker, and Illumination LEDs

8.1 Beeper

(1) Beeping

The scanner emits a short or long beeps, once or a couple of times as described below.

The beeper emits **a short beep** when:

- the scanner has read a code successfully,
- code data read matches the master data in the Data verification mode,
- the scanner has read a Structured Appended QR (iQR) Code symbol,
- the "Start setting" or "End setting" code is read (3 beeps) or the parameter setting QR Code symbols are read (1 beep) from the QR-coded parameter menu (given in Chapter 12),
- the configuration software (ScannerSetting_2D) starts up or accepts new settings (3 beeps), or
- the scanner has read a batch-process QR Code symbol generated with the configuration software (ScannerSetting_2D) (3 beeps).

The beeper emits **a long beep** when:

- code data read does not match the master data in the Data verification mode,
- the scanner has read Structured Appended QR (iQR) Code symbols in edit mode and the accumulated data exceeds 8 kilobytes,
- a master code has the wrong number of digits during registration of master data,
- a code other than a parameter setting code is read during parameter setting by the QR-coded parameter menu,
- a transmission error or timeout occurred when the scanner was communicating with the configuration software (ScannerSetting_2D),
- the encryption key of data read does not match the one configured in the scanner in SQRC scanning (when the "data transmission after mismatch of encryption key" is disabled),
- a communications error has occurred, or
- an invalid control command is received.

When the scanner is turned on, the configuration software (ScannerSetting_2D) provides a choice of beeper ON/OFF (default: ON), but does not provide a choice of beeper tone.

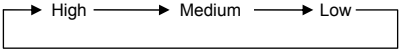
You can disable the beeper using the QR-coded parameter menu or configuration software (ScannerSetting_2D)*. In any of the following cases, however, the beeper sounds regardless of that beeper setting:

- when you make settings by scanning the QR-coded parameter menu,
- when the scanner receives a beeper-ON command from the host computer,
- when the configuration software (ScannerSetting_2D) starts up or any setting you have made is established,
- when the scanner reads a batch-process QR Code symbol, and
- when the parameter values are saved by a PW command (refer to Appendix 2).

(2) Adjusting the beeper volume

You can adjust the beeper volume to three levels--high, medium and low--using the QR-coded parameter menu or configuration software (ScannerSetting_2D). The factory default is High.

Each time the "Beeper volume" QR Code symbol is read, the beeper volume cycles as shown below.



Even if the scanner is turned off, this setting will be retained.

8.2 Indicator LED

The indicator LED lights or flashes in blue, green, or red as described below.

The indicator LED lights **in blue** when:

- the scanner has read a code successfully,
- the "Start setting" or "End setting" code is read from the QR-coded parameter menu (given in Chapter 12),
- the scanner starts or ends a sequence of Structured Appended QR (iQR) Code scanning,
- the scanner has read a Structured Appended QR (iQR) Code symbol,
- the parameter values are saved by a PW command (refer to Appendix 2),
- code data read matches the master data in the Data verification mode, or
- master data has been successfully registered in the Data verification mode.

The indicator LED lights **in green** when:

- the scanner is ready to register master data.

The indicator LED lights **in red** when:

- the scanner has received an abnormal control command,
- the scanner has failed to edit data read,
- code data read does not match the master data in the Data verification mode,
- a master code has the wrong number of digits during registration of master data,
- the scanner has read Structured Appended QR (iQR) Code symbols in edit mode and the accumulated data exceeds 8 kilobytes,
- the scanner has failed to save parameter values specified with the configuration software (ScannerSetting_2D), QR-coded parameter menu, or control commands,
- a code other than a parameter setting code is read during parameter setting by the QR-coded parameter menu,
- a transmission error or timeout occurred when the scanner was communicating with the configuration software (ScannerSetting_2D),
- a run-time error has occurred in ADF script, or
- the trigger switch is pressed when the trigger switch control is disabled.

The indicator LED **flashes in red** when:

- no master data has been registered in the Data verification mode.

The indicator LED lights **in blue and green** alternately when:

- the interface has switched between the RS-232C and USB interfaces by turning the scanner power on with the trigger switch held down.

The indicator LED can be disabled with the QR-coded parameter menu or configuration software (ScannerSetting_2D). In any of the following cases, however, the indicator LED comes on regardless of the current LED setting.

- When the scanner is being customized with the QR-coded parameter menu (Chapter 12),
- When the scanner receives an LED-ON command (LB, LG or LR) from the host computer (refer to Appendix 2),
- When the configuration software (ScannerSetting_2D) starts up or any setting is newly established,
- When the scanner reads a batch-process QR Code symbol,
- When the parameter values are saved by a PW command (refer to Appendix 2),
- When the scanner is in the scanner entry mode (refer to control command “E” in Appendix 2),
- When a master code is being registered or the registration is completed,
- When any error has occurred during registration of a master code,
- When the scanner has failed to save parameter values specified with the configuration software (ScannerSetting_2D), QR-coded parameter menu, or control commands,
- When a run-time error has occurred in ADF script, or
- When the trigger switch is pressed when the trigger switch control is disabled.

8.3 Marker

The red marker LED lights up to indicate the approximate center of the reading area.

The marker provides a choice of the three modes--normal marker mode, marker-OFF mode and marker-ON mode that can be selected by using the QR-coded parameter menu or the configuration software (ScannerSetting_2D).

(1) Normal marker mode

When the trigger switch is in the Auto-off mode or auto-off state of the Auto stand mode

When the scanner is ready to scan (that is, within approx. 5 seconds from the depression of the trigger switch or until completion of reading from that), the marker LED remains on. If you release the trigger switch when the scanner is ready, the marker LED will go off.

When the trigger switch is in the Momentary switching mode or Alternate switching mode:

In the momentary switching mode, holding down the trigger switch turns on the marker LED.

When the scanner is ready to scan (that is, while the trigger switch is held down in the momentary switching mode or when the scanner is ready to scan in the alternate switching mode), the marker LED remains on. When the scanner is on standby (that is, the trigger switch is released in the momentary switching mode or when the scanner is on standby in the alternate switching mode), the marker LED will go off.

When the trigger switch is in the Momentary switching mode (Reverse Type):

In the momentary switching mode (Reverse Type), the marker remains on while the trigger switch is in the released position.
When the scanner is ready to scan (that is, the trigger switch is released in the momentary switching mode reverse type), the marker LED remains on. When the scanner is on standby (that is, while the trigger switch is held down in the momentary switching mode reverse type), the marker LED will go off.

In the Continuous reading mode 1 or 2:

Turning the scanner on activates the marker and keeps it on.

If the scanner receives the Z, READOFF or LOFF command, it turns off the marker LED; if it receives the R, READON or LON command, it keeps the marker LED on.

In the Auto sensing mode or auto sense state of the Auto stand mode

When the scanner senses a code coming into the readable area and becomes ready to scan, it automatically turns on the marker LED. After approx. 3 seconds from completion of scanning or if scanning is not completed within approx. 3 seconds, the scanner switches to standby and turns off the marker LED.

(2) Marker-OFF mode

The marker LED will not come on under any conditions.

(3) Marker-ON mode

When the scanner switches to standby, the marker LED is turned on for approx. 30 seconds.

When it is ready to scan, the marker LED remains on.

8.4 Illumination LEDs

When the scanner is ready to scan, the illumination LEDs flash.

The illumination LEDs provide the two choices--ON, OFF by using the configuration software (ScannerSetting_2D).

Enable or disable of “Power save mode” can be selected. The default setting is “Disable”.
When “Power save mode” is enabled, 20% power consumption is saved by less brightness of the illumination LEDs.

(Note) When “Power save mode” is enabled, a reading distance may be shorter under 500 lx ambient illumination.

Chapter 9 Communication

9.1 RS-232C Interface

With the RS-232C interface being selected, the scanner uses asynchronous data transmission and communicates with the host computer or external equipment via the RS-232C. You can set various communications conditions using the QR-coded parameter menu or configuration software (ScannerSetting_2D). Code data read is transferred in the following format.

(1) Communications protocol

You can select either non-acknowledge mode or ACK/NAK mode.

Non-acknowledge mode (default)

If the CTS signal is at a high level (Enable transmission), the scanner transmits code data read.

Note: The configuration software (ScannerSetting_2D) provides CTS timeout settings from 100 ms to 9.9 s in 100-ms increments and two CTS signal control choices Yes and No.

ACK/NAK mode

If the CTS signal is at high level (Enable transmission), the scanner transmits code data read. After that, the scanner waits for and then processes a response. If the response is an ACK, the scanner normally ends the transmission; if it is a NAK, the scanner transmits the code data again.

Note: The configuration software (ScannerSetting_2D) provides CTS timeout and ACK/NAK response settings each from 100 ms to 9.9 s in 100-ms increments.

(2) RTS signal control protocol

You can select either the scanner ready mode or the data ready mode.

Scanner ready mode (default)

The RTS signal goes High and stays at a high level when the scanner is ready to communicate at power on. Make sure that the RTS signal is at a high level when transmitting a command from the host to the scanner.

Data ready mode

The RTS signal goes High before the scanner transmits data to the host and goes Low after the data transmission is completed.

Commands can be transmitted from the host to the scanner regardless of the level of the RTS signal. However, there is a short time when commands cannot be transmitted to the scanner after power has been turned on.

(3) Transmission speed

There are six transmission speeds available, ranging from 4800 bps to 115200 bps (default: 38400 bps).

(4) Characters

Characters that the scanner transfers are all ASCII codes. The frame format has the following parameters.

Data bits:	7 bits or 8 bits (default)
Parity:	Odd, Even, or None (default)
Stop bits:	1 bit (default) or 2 bits

Note: When data contains binary data or 2-byte codes, selecting “7 bits” for the data bits transfers the 2-byte codes with the most significant bits trimmed.

9.2 USB-COM Interface

This scanner is compliant with USB 1.1 (Universal Serial Bus Specification Revision 1.1).

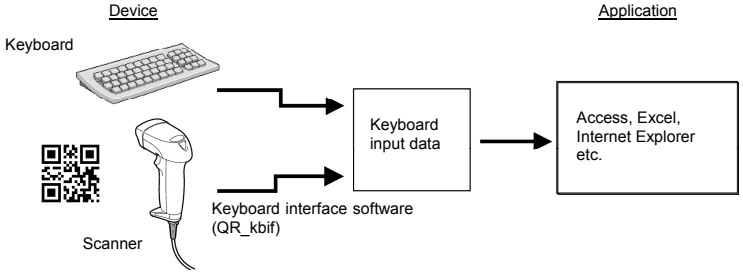
Installing the dedicated Active USB-COM port driver to the host computer allows the USB-COM interface to operate in communications applications using the conventional serial port.

Note: Entering data transferred from the scanner via the USB-COM interface directly to application (e.g., Access, Excel, and Internet Explorer) running on the host computer requires the keyboard interface software(QR_kbif)*.

As shown below, the QR_kbif converts the data read into the keying format and passes it to applications in the manner as if it is coming from the keyboard. It is, therefore, possible for applications capable of accepting keyed data to handle the data read by the scanner.

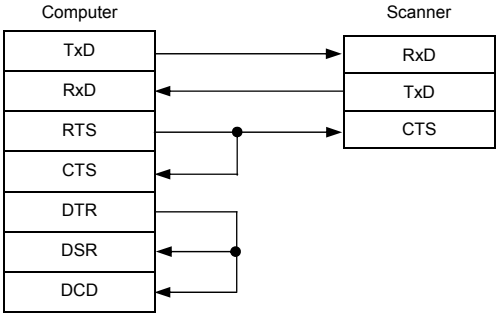
* Registered users can download the keyboard interface software (QR_kbif) from QBdirect, their customer support section on the Denso Wave website at no extra charge. For further details on QBdirect or to register, visit the following URL.

http://www.qbdirect.net



■ Notes for use

- In such a case, reboot the host computer, open the Device Manager, and check the COM port number actually assigned by OS before use.
- If you want to use two or more communications processors (software) or scanners concurrently on your computer, be sure to assign a unique COM port number to each of them.
- If the host computer switches to the suspend mode when any communications software is running and recovers from that suspend mode, the software may freeze in some computers. Quit and restart the software.
- It is not necessary to make settings such as transmission speed, data bits, parity, and stop bits (which are required for communications software using a conventional serial port) since the USB interface ignores those settings. The flow control should be set to “Hardware (RTS/CTS)” or “None.”
- The virtual COM port on the computer and the scanner are connected with each other as shown below.



■ Communications protocol

You can select either non-acknowledge mode or ACK/NAK mode.

Non-acknowledge mode (default)

If the CTS signal is at a high level (Enable transmission), the scanner transmits code data read.

Note: The configuration software (ScannerSetting_2D) provides a choice of CTS timeout settings from 100 ms to 9.9 s in 100-ms increments and two CTS signal control choices Yes and No.

ACK/NAK mode

If the CTS signal is at high level (Enable transmission), the scanner transmits code data read. After that, the scanner waits for and then processes a response. If the response is an ACK, the scanner normally ends the transmission; if it is a NAK, the scanner transmits the code data again.

Note: The configuration software (ScannerSetting_2D) provides a choice of CTS timeout and ACK/NAK response time settings each from 100 ms to 9.9 s in 100-ms increments.

■ Remote wake-up

You can cancel the standby state of the host by pressing the scanner's trigger switch (enabled at default). Select either ON or OFF of the remote wake-up.

Note: You cannot use the remote wake-up function if:

- The host does not support the remote wake-up.
- The remote wake-up is disabled by the scanner setting.

9.3 USB Keyboard Interface

The USB keyboard interface requires no dedicated device driver. Data read by the scanner can be entered to the cursor position in your application.

The USB keyboard interface operates in conformity with the following:

- Universal Serial Bus (USB) Device Class Definition for Human Interface Devices (HID) Version 1.11
- Universal Serial Bus (USB) HID Usage Tables Version 1.11 keyboard

(1) CAPS Lock state

Select the CAPS Lock ON or OFF to match the state of the connected keyboard. (Default: CAPS Lock OFF)

(2) Keyboard type

Select the type of the connected keyboard. (Default: Type 106, Japanese)

(3) Numeric data transmission format

Select the "inboard numeric keys" or "numeric keypad" on the connected keyboard. (Default: Inboard numeric keys)

(4) Binary conversion

Select the conversion type to be applied to data read, from the following:

- "No conversion" (ASCII) (default) : Outputs 00h to 7Fh data in ASCII format bytewise. Selecting this parameter does not output 80h to FFh data.
- "Binary conversion" : Converts 00h to FFh data to binary format and outputs it bytewise.
- "Kanji conversion" : Converts 00h to FFh data to Shift-JIS format and outputs it, two bytes at a time. If there is any data to which this Kanji conversion cannot apply, it converts such data to binary format and outputs it bytewise instead.

Binary conversion format	Output data	Note
No conversion	No output	Scanning complete operation only.
Binary conversion	8Ah BFh 8Eh 9Ah Assigned characters	Output with binary data 1 byte by 1 byte
Kanji conversion	"Kanji"	Output with Kanji conversion (Note)

Note that some applications may fail to output converted data as it is displayed.

(5) Data transmission interval

Select the data transmission interval to be applied when the scanner sends data read to the host computer. There are seven choices from 1 ms to 100 ms (default: 10 ms).

(6) Remote wake-up

You can cancel the standby state of the host by pressing the scanner's trigger switch (enabled at default). Select either ON or OFF of the remote wake-up.

Note: You cannot use the remote wake-up function if:
- The host does not support the remote wake-up.
- The remote wake-up is disabled by the scanner setting.

9.4 Communication Format

■ Data transmission format

Select one of the following two data transmission formats.

Header	Scanner ID	Code ID mark	Prefix	No. of digits				Code data	Suffix	Terminator	BCC
				n1	n2	n3	n4				

Header	Scanner ID	Prefix	Code ID mark	No. of digits				Code data	Suffix	Terminator	BCC
				n1	n2	n3	n4				

(1) Header/Terminator

The following choices are available.

RS-232C interface, USB-COM interface

Header: None (default), STX, or user-defined one
Terminator: CR (default), none, LF, CR/LF, ETX, or user-defined one

USB keyboard interface

Header: None (default), TAB, ESC, ENTER or others
Terminator: None, TAB, ESC, ENTER (default) or others

For details, refer to Chapter 11.

(2) Scanner ID

A scanner ID is a unique serial number assigned to an individual scanner at the time of shipment. It consists of six numerals.

(3) Prefix/Suffix

A prefix or suffix consists of up to eight ASCII characters (00h to FFh). You can set a prefix or suffix with the configuration software (ScannerSetting_2D). (Default: No prefix or suffix)

(4) BCC

The Block Character Check (BCC) exclusive-ORs all bits at the same bit level in characters following the header and preceding the terminator in a transmission block to generate a horizontal parity byte to be transferred in a binary code. The BCC can be enabled or disabled. If no header is prefixed or the USB keyboard interface is selected, no BCC will be transferred.

(5) Code ID mark

This optional field specifies the code system. It offers ten combinations with five code ID marks (Type 1, Type 2, Type 3, Type 4, and user-defined) and two output modes (coupling and separating) as listed below.

You can also select whether or not to transmit the code ID mark. (Default: No transmission)

(1/2)

Code type			Code ID mark			
			Type 1		Type 2	
			Coupling	Separating	Coupling	Separating
2D codes	QR Code		Q		Q	
	Structured Appended QR Code	Edit mode	Q		Q	
		Batch edit mode	Q		Q	
		Non-edit mode	S		S	
	MicroQR Code		Q		Q	
	SQRC		Q		Q	
	iQR Code		G		G	
	Structured Appended iQR Code	Edit mode	G		G	
		Non-edit mode	S		S	
	MaxiCode		X		X	
	PDF417		Y		Y	
	MicroPDF417		Y		Y	
	Data Matrix	Square	Z		Z	
		Rectangular	Z		Z	
	Aztec		J		J	

Code type				Code ID mark			
				Type 1		Type 2	
				Coupling	Separating	Coupling	Separating
Bar codes	UPC-A	Without add-on		A		A	
		With 2-digit add-on	Linear component	A		A	
			Add-on	None		None	
		With 5-digit add-on	Linear component	A		A	
			Add-on	None		None	
	UPC-E	Without add-on		C		E	
		With 2-digit add-on	Linear component	C		E	
			Add-on	None		None	
		With 5-digit add-on	Linear component	C		E	
			Add-on	None		None	
	EAN-13	Without add-on		A		F	
		With 2-digit add-on	Linear component	A		F	
			Add-on	None		None	
		With 5-digit add-on	Linear component	A		F	
			Add-on	None		None	
	EAN-8	Without add-on		B		FF	
		With 2-digit add-on	Linear component	B		FF	
			Add-on	None		None	
		With 5-digit add-on	Linear component	B		FF	
			Add-on	None		None	
	Interleaved 2of5			I		I	
	Standard 2of5(short)			H		H	
	Standard 2of5(normal)			H		H	
	Code 39			M		M	
	Code 39 Full ASCII			M		M	
	Codabar (NW-7)			N		N	
	Code 128			K		K	
	GS1-128 (EAN-128)			W		W	
	Code 93			L		L	
	GS1 DataBar (RSS) (Note 1)			R		R	

Code type					Code ID mark			
					Type 1		Type 2	
					Coupling	Separating	Coupling	Separating
EAN.UCC Composite symbols	RSS (Note 1) CC-A RSS (Note 1) CC-B		RSS		V	R	V	R
			CC-A, CC-B		None	Y (Note 2)	None	Y (Note 2)
	UPC-A CC-A, UPC-A CC-B	UPC-A	Without add-on		V	A	V	A
			With 2-digit add-on	Linear component	V	A	V	A
				Add-on	None	None	None	None
			With 5-digit add-on	Linear component	V	A	V	A
				Add-on	None	None	None	None
		CC-A, CC-B			None	Y (Note 2)	None	Y (Note 2)
	EAN-13 CC-A, EAN-13 CC-B	EAN-13	Without add-on		V	A	V	F
			With 2-digit add-on	Linear component	V	A	V	F
				Add-on	None	None	None	None
			With 5-digit add-on	Linear component	V	A	V	F
				Add-on	None	None	None	None
		CC-A, CC-B			None	Y (Note 2)	None	Y (Note 2)
	UPC-E CC-A, UPC-E CC-B	UPC-E	Without add-on		V	C	V	E
			With 2-digit add-on	Linear component	V	C	V	E
				Add-on	None	None	None	None
			With 5-digit add-on	Linear component	V	C	V	E
				Add-on	None	None	None	None
		CC-A, CC-B			None	Y (Note 2)	None	Y (Note 2)
	EAN-8 CC-A, EAN-8 CC-B	EAN-8	Without add-on		V	B	V	FF
			With 2-digit add-on	Linear component	V	B	V	FF
				Add-on	None	None	None	None
			With 5-digit add-on	Linear component	V	B	V	FF
				Add-on	None	None	None	None
		CC-A, CC-B			None	Y (Note 2)	None	Y (Note 2)
	EAN-128 CC-A, EAN-128 CC-B, EAN-128 CC-C	GS1-128 (EAN-128)			V	W	V	W
		CC-A, CC-B, CC-C			None	Y (Note 2)	None	Y (Note 2)

Code type			Code ID mark			
			Type 3		Type 4 (Note 3)	
			Coupling	Separating	Coupling	Separating
2D codes	QR Code		P01		]Qm	
	Structured Appended QR Code	Edit mode	P01		]Qm	
		Batch edit mode	P01		]Qm	
		Non-edit mode	P01		S (Note 4)	
	MicroQR Code		P01		Q (Note 4)	
	SQRC		P01		Q (Note 4)	
	iQR Code		G		]Qm	
	Structured Appended iQR Code	Edit mode	G		]Qm	
		Non-edit mode	S		S	
	MaxiCode		P02		]Um	
	PDF417		X		]L0	
	MicroPDF417		X		]L0	
	Data Matrix	Square	P00		]dm	
		Rectangular	P00		]dm	
	Aztec		z		]zm	

Code type				Code ID mark			
				Type 3		Type 4 (Note 3)	
				Coupling	Separating	Coupling	Separating
Bar codes	UPC-A	Without add-on		A		]X0	
		With 2-digit add-on	Linear component	A		]X3	]X0
			Add-on	None		None	]X1 (Note 2)
		With 5-digit add-on	Linear component	A		]X3	]X0
			Add-on	None		None	]X2 (Note 2)
	UPC-E	Without add-on		A		]X0	
		With 2-digit add-on	Linear component	A		]X3	]X0
			Add-on	None		None	]X1 (Note 2)
		With 5-digit add-on	Linear component	A		]X3	]X0
			Add-on	None		None	]X2 (Note 2)
	EAN-13	Without add-on		A		]E0	
		With 2-digit add-on	Linear component	A		]E3	]E0
			Add-on	None		None	]E1 (Note 2)
		With 5-digit add-on	Linear component	A		]E3	]E0
			Add-on	None		None	]E2 (Note 2)
	EAN-8	Without add-on		A		]E4	
		With 2-digit add-on	Linear component	A		]E5	]E4
			Add-on	None		None	]E1 (Note 2)
		With 5-digit add-on	Linear component	A		]E6	]E4
			Add-on	None		None	]E2 (Note 2)
	Interleaved 2of5			F		]Im	
	Standard 2of5(short)			G		]R0	
	Standard 2of5(normal)			G		]S0	
	Code 39			B		]Am	
	Code 39 Full ASCII			B		]Am	
	Codabar (NW-7)			C		]Fm	
	Code 128			D		]Cm	
	GS1-128 (EAN-128)			K		]C1	
	Code 93			E		]G0	
	GS1 DataBar (RSS) (Note 1)			R		]e0	

Code type					Code ID mark			
					Type 3		Type 4 (Note 3)	
					Coupling	Separating	Coupling	Separating
EAN.UCC Composite symbols	RSS (Note 1) CC-A RSS (Note 1) CC-B		RSS		T	R	]e0	
			CC-A, CC-B		None	X (Note 2)	None	
	UPC-A CC-A, UPC-A CC-B	UPC-A	Without add-on		T	A	]X0	
			With 2-digit add-on	Linear component	T	A	]X3	]X0
				Add-on	None	None	None	]X1 (Note 2)
			With 5-digit add-on	Linear component	T	A	]X3	]X0
				Add-on	None	None	None	]X2 (Note 2)
		CC-A, CC-B			None	X (Note 2)	]e0 (Note 2)	
	EAN-13 CC-A, EAN-13 CC-B	EAN-13	Without add-on		T	A	]E0	
			With 2-digit add-on	Linear component	T	A	]E3	]E0
				Add-on	None	None	None	]E1 (Note 2)
			With 5-digit add-on	Linear component	T	A	]E3	]E0
				Add-on	None	None	None	]E2 (Note 2)
		CC-A, CC-B			None	X (Note 2)	]e0 (Note 2)	
	UPC-E CC-A, UPC-E CC-B	UPC-E	Without add-on		T	A	]X0	
			With 2-digit add-on	Linear component	T	A	]X3	]X0
				Add-on	None	None	None	]X1 (Note 2)
			With 5-digit add-on	Linear component	T	A	]X3	]X0
				Add-on	None	None	None	]X2 (Note 2)
		CC-A, CC-B			None	X (Note 2)	]e0 (Note 2)	
	EAN-8 CC-A, EAN-8 CC-B	EAN-8	Without add-on		T	A	]E4	
			With 2-digit add-on	Linear component	T	A	]E5	]E4
				Add-on	None	None	None	]E1 (Note 2)
			With 5-digit add-on	Linear component	T	A	]E6	]E4
				Add-on	None	None	None	]E2 (Note 2)
		CC-A, CC-B			None	X (Note 2)	]e0 (Note 2)	
	EAN-128 CC-A, EAN-128 CC-B, EAN-128 CC-C	GS1-128 (EAN-128)			T	K	]e0	
		CC-A, CC-B, CC-C			None	X (Note 2)	None	

(Note 1) GS1 DataBar (RSS) represents: RSS-14 (GS1 DataBar Omnidirectional), RSS-14 Truncated (GS1 DataBar Truncated), RSS-14 Limited (GS1 DataBar Limited), RSS-14 Stacked (GS1 DataBar Stacked), RSS Expanded (GS1 DataBar Expanded), RSS-14 Stacked Omnidirectional (GS1 DataBar Stacked Omnidirectional), and RSS Expanded Stacked (GS1 DataBar Expanded Stacked).

(Note 2) These code ID marks are contained in code data.

(Note 3) Type 4 is a code ID mark system compliant with the AIM USA "Guidelines on Symbology Identifiers." The "m" suffix is a modifier character that differs depending upon options of individual symbologies as defined below.

Code Type		"m" (Modifier character)	Options
2D codes	QR Code	0	Model 1
		1	Model 2
	iQR Code	A	No FNC1 in the 1st character positions from start code
		C	FNC1 in the 1st character positions from start code
		E	FNC1 in the 2nd character positions from start code
	MaxiCode	0	mode 4, mode 5
		1	mode 2, mode 3
	Data Matrix	1	ECC-200
		2	ECC-200 (FNC1 in the 1st or 5th character position from start code)
		3	ECC-200 (FNC1 in the 2nd or 6th character position from start code)
	Aztec	0	No options
		1	FNC1 preceding the 1st message character
		2	FNC1 subsequent to the 1st character or digit pair
Bar codes	Interleaved 2of5	0	Scanning enabled, without a check digit
		1	Scanning enabled, with a check digit (Check digit transmission enabled)
		3	Scanning enabled, with a check digit (Check digit transmission disabled)
	Code 39 Code 39 Full ASCII	0	Scanning enabled, without a check digit
		1	Scanning enabled, with a check digit (Check digit transmission enabled)
		3	Scanning enabled, with a check digit (Check digit transmission disabled)
	Codabar	0	Scanning enabled, without a check digit
		1	Scanning enabled, with a check digit (Check digit transmission enabled)
		3	Scanning enabled, with a check digit (Check digit transmission disabled)
	Code 128	0	No FNC1 in the 1st and 2nd character positions from start code
		2	FNC1 in the 2nd character position from start code

Example: The code ID mark for Interleaved 2of5 with option "Scanning enabled, with a check digit (Check digit transmission disabled)" is]I3.

]: Flag character (ASCII 93h)
I: Code character (Interleaved 2of5)
3: Modifier character (See the table above.)

(Note 4) For code ID marks not compliant with the AIM USA "Guidelines on Symbology Identifiers," same characters as ones defined in Type 1 apply.

(6) Number of digits

This optional field specifies whether or not to transmit the number of digits (2 or 4 bytes) of code data to transmit or disables the transmission (default). Note that UPC and EAN codes (except GS1-128 (EAN-128)) skip this field.

4 digits (4 byte) transmission

n1 : thousands (0 to 9)
n2 : hundreds (0 to 9)
n3 : tens (0 to 9)
n4 : units (0 to 9)

2 digits (2 byte) transmission

n1 : tens (0 to 9)
n2 : units (0 to 9)

(7) Code data

The data format for each symbology is described below.

QR Code / MicroQR Code / iQR Code

Code data read will be transmitted as is.

Structured Appended QR Code / Structured Appended iQR Code

In edit mode and batch edit mode(Sprit QR Code only): The scanner edits code data read and then transmits it. It does not transmit the code number, number of splits, or parity.

In non-edit mode: The scanner transmits the code number, the number of splits, parity, and code data read. The code number and the number of splits are 1 byte each and the parity, 2 bytes in hexadecimal format.

SQRC

Code data read will be transmitted as is. When “Enable transmission of disclosed data only” is selected in “SQRC Encryption key match”, it transmits only non-disclosure data.

X1 X2 ･･･Xn-1 Xn Y1 Y2 ･･･Ym-1 Ym

Xn：Disclosure data

Ym：Non-disclosure data

When “Disclosure data plus non-disclosure data” is selected, the following format applies.

X1 X2 ･･･Xn-1 Xn Y1 Y2 ･･･Ym-1 Ym

When “Transmit only non-disclosure data” is selected, the following format applies.

Y1 Y2 ･･･Ym-1 Ym

PDF417, MicroPDF417, MaxiCode Data Matrix and Aztec

Code data read will be transmitted as is.

UPC-A

You can select whether or not to transmit the padding character “0,” number system character “S,” and a check digit to the host. Disabling the transmission of the number system character “S” automatically disables the transmission of the padding character “0.”

The conversion to the GTIN format is selectable. For the GTIN format conversion, refer to Section 9.5.

When the conversion to the GTIN format is disabled, the following format applies.

0 S X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} C/D

0: Padding character for adjustment of the data length
S: Number system character

UPC-A with add-on

A code ID mark precedes add-on code data under the conditions “Code ID mark: Type 4” and “Code ID mark output mode: Separating.” (For details about the code ID mark, refer to (5) Code ID mark.)

The conversion to the GTIN format is selectable. For the GTIN format conversion, refer to Section 9.5.

When the conversion to the GTIN format is disabled, the following formats apply.

With 2-digit add-on:
0 S X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} C/D X_{11} X_{12}

With 5-digit add-on:
0 S X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} C/D X_{11} X_{12} X_{13} X_{14} X_{15}

0: Padding character for adjustment of the data length
S: Number system character
$X_{11\text{-}15}$: Add-on code data

UPC-E

You can select whether or not to transmit the padding character "0," number system character "S," and a check digit to the host. Disabling the transmission of the number system character "S" automatically disables the transmission of the padding character "0."

The conversion to the GTIN format or to the UPC-A are selectable. For the GTIN format conversion, refer to Section 9.5.

When the conversion to the GTIN format is disabled, the following formats apply.

- Conversion to UPC-A disabled

$X_1\ X_2\ X_3\ X_4\ X_5\ X_6$ C/D

- Conversion to UPC-A enabled

X_6=0-2	0 S $X_1\ X_2\ X_6$ 0 0 0 0 $X_3\ X_4\ X_5$ C/D
X_6=3	0 S $X_1\ X_2\ X_3$ 0 0 0 0 0 $X_4\ X_5$ C/D
X_6=4	0 S $X_1\ X_2\ X_3\ X_4$ 0 0 0 0 0 X_5 C/D
X_6=5-9	0 S $X_1\ X_2\ X_3\ X_4\ X_5$ 0 0 0 0 X_6 C/D

0: Padding character for adjustment of the data length
S: Number system character

UPC-E with add-on

A code ID mark precedes add-on code data under the conditions "Code ID mark: Type 4" and "Code ID mark output mode: Separating." (For details about the code ID mark, refer to (5) Code ID mark)

The conversion to the GTIN format or to the UPC-A are selectable. For the GTIN format conversion, refer to Section 9.5.

When the conversion to the GTIN format is disabled, the following formats apply.

With 2-digit add-on:
- Conversion to UPC-A disabled

0 $X_1\ X_2\ X_3\ X_4\ X_5\ X_6$ C/D $X_7\ X_8$

- Conversion to UPC-A enabled

X_6=0-2	0 S $X_1\ X_2\ X_6$ 0 0 0 0 $X_3\ X_4\ X_5$ C/D $X_7\ X_8$
X_6=3	0 S $X_1\ X_2\ X_3$ 0 0 0 0 0 $X_4\ X_5$ C/D $X_7\ X_8$
X_6=4	0 S $X_1\ X_2\ X_3\ X_4$ 0 0 0 0 0 X_5 C/D $X_7\ X_8$
X_6=5-9	0 S $X_1\ X_2\ X_3\ X_4\ X_5$ 0 0 0 0 X_6 C/D $X_7\ X_8$

With 5-digit add-on:
- Conversion to UPC-A disabled

0 $X_1\ X_2\ X_3\ X_4\ X_5\ X_6$ C/D $X_7\ X_8\ X_9\ X_{10}\ X_{11}$

- Conversion to UPC-A enabled

X_6=0-2	0 S $X_1\ X_2\ X_6$ 0 0 0 0 $X_3\ X_4\ X_5$ C/D $X_7\ X_8\ X_9\ X_{10}\ X_{11}$
X_6=3	0 S $X_1\ X_2\ X_3$ 0 0 0 0 0 $X_4\ X_5$ C/D $X_7\ X_8\ X_9\ X_{10}\ X_{11}$
X_6=4	0 S $X_1\ X_2\ X_3\ X_4$ 0 0 0 0 0 X_5 C/D $X_7\ X_8\ X_9\ X_{10}\ X_{11}$
X_6=5-9	0 S $X_1\ X_2\ X_3\ X_4\ X_5$ 0 0 0 0 X_6 C/D $X_7\ X_8\ X_9\ X_{10}\ X_{11}$

0: Padding character for adjustment of the data length
S: Number system character
$X_{7\text{-}11}$: Add-on code data

EAN-13

You can select whether or not to transmit the two prefix characters "P_1" and "P_2" and a check digit to the host. The conversion to the ISBN/ISSN format is selectable. Enabling the conversion allows EAN-13 code with prefix characters 978 or 979 to be converted into the ISBN format, and EAN-13 code with prefix characters 977, into the ISSN format.

The conversion to the GTIN format is also selectable. For the GTIN format conversion, refer to Section 9.5.

When the conversion to the GTIN format is disabled, the following formats apply.

- Conversion to ISBN/ISSN disabled

$P_1\ P_2\ P_3\ X_1\ X_2\ X_3\ X_4\ X_5\ X_6\ X_7\ X_8\ X_9$ C/D

P*n*: Prefix characters

- Conversion to ISBN/ISSN enabled

To the ISBN format

$X_1\ X_2\ X_3\ X_4\ X_5\ X_6\ X_7\ X_8\ X_9$ C/D (*1)

To the ISSN format

$X_1\ X_2\ X_3\ X_4\ X_5\ X_6\ X_7$ C/D (*1)

(*1) Check digits in the ISBN/ISSN format are calculated (MOD-11) and transferred to the host.

EAN-13 with add-on

A code ID mark precedes add-on code data under the conditions "Code ID mark: Type 4" and "Code ID mark output mode: Separating." (For details about the code ID mark, refer to (5) Code ID mark)

The conversion to the GTIN format is selectable. For the GTIN format conversion, refer to Section 9.5.

When the conversion to the GTIN format is disabled, the following formats apply.

With 2-digit add-on:

$P_1\ P_2\ P_3\ X_1\ X_2\ X_3\ X_4\ X_5\ X_6\ X_7\ X_8\ X_9$ C/D $X_{10}\ X_{11}$

With 5-digit add-on:

$P_1\ P_2\ P_3\ X_1\ X_2\ X_3\ X_4\ X_5\ X_6\ X_7\ X_8\ X_9$ C/D $X_{10}\ X_{11}\ X_{12}\ X_{13}\ X_{14}$

P*n*: Prefix characters
$X_{10\text{-}14}$: Add-on code data

EAN-8

You can select whether or not to transmit a check digit to the host. The conversion to EAN-13 is selectable.

The conversion to the GTIN format is also selectable. For the GTIN format conversion, refer to Section 9.5.

When the conversion to the GTIN format is disabled, the following formats apply.

- Conversion to EAN-13 disabled

$P_1\ P_2\ P_3\ X_1\ X_2\ X_3\ X_4$ C/D

- Conversion to EAN-13 enabled

0 0 0 0 0 $P_1\ P_2\ P_3\ X_1\ X_2\ X_3\ X_4$ C/D

P*n*: Prefix characters

EAN-8 with add-on

A code ID mark precedes add-on code data under the conditions “Code ID mark: Type 4” and “Code ID mark output mode: Separating.” (For details about the code ID mark, refer to (5) Code ID mark)

The conversion to the GTIN format is selectable. For the GTIN format conversion, refer to Section 9.5.

When the conversion to the GTIN format is disabled, the following formats apply.

With 2-digit add-on:
P_1 P_2 P_3 X_1 X_2 X_3 X_4 C/D X_5 X_6

With 5-digit add-on:
P_1 P_2 P_3 X_1 X_2 X_3 X_4 C/D X_5 X_6 X_7 X_8 X_9

P*n*: Prefix characters
$X_{5\text{-}9}$: Add-on code data

Code 39

Code data read will be transmitted as is.

You can select whether or not to transmit start and stop codes (“*”).

Interleaved 2of5, Standard 2of5

The scanner transmits code data read, starting from the character following the start code to the one preceding the stop code. No start/stop codes will be transmitted.

Codabar (NW-7)

The scanner transmits code data read including the start/stop codes. You can select whether or not to transmit start/stop codes.

Code 128 (GS1-128(EAN-128))

The scanner transmits code data read, starting from the character following the start code to the one preceding the check digit. Start/stop codes, FNC codes, or check digit will not be transmitted. Note that FNC1 placed in character positions other than the 1st and 2nd ones from the start code will be converted to GS (1Dh) and transferred, and can be selectable from either transferred or user selection.

The conversion to the GTIN format is also selectable. For the GTIN format conversion, refer to Section 9.5.

Code 93

The scanner transmits code data read, excluding start and stop codes and a check digit.

GS1 DataBar (RSS)

Code data read will be transmitted as is.

FNC1 of GS1 DataBar Expanded (RSS Expanded) will be converted to GS(1Dh) and can be selectable from either transferred or user selection.

The conversion to the GTIN format is also selectable. For the GTIN format conversion, refer to Section 9.5.

GS1 DataBar (RSS) Composite symbols

Code data read will be transmitted as is.

Under the conditions "Code ID mark: Type 1" and "Code ID mark output mode: Separating," a separator (GS: 1Dh) and 2D code ID mark are inserted between the linear component and 2D Composite component. (For details about the code ID mark, refer to (5) Code ID mark)

Under the conditions "Code ID mark: Type 4" and "Linear component length (RSS/EAN-128): Variable," a separator (GS: 1Dh) is inserted between the linear component and 2D Composite component.

UPC/EAN Composite symbols

Code data read will be transmitted as is.

You can select whether or not to transmit a check digit of the linear component (UPC/EAN).

Under the conditions "Code ID mark: Type 1" and "Code ID mark output mode: Separating," a separator (GS: 1Dh) and 2D code ID mark are inserted between the linear component and 2D Composite component.

Under the conditions "Code ID mark: Type 2," the 2D code ID mark is inserted between the linear component and 2D Composite component. (For details about the code ID mark, refer to (5) Code ID mark)

9.5 GTIN Format Conversion

Enabling the GTIN (Global Trade Item Number) format conversion allows UPC-A, UPC-E, EAN-13, EAN-8, and Interleaved 2of5 (14-digit) data to output in the GTIN format. It also allows GS1 DataBar (RSS) and GS1-128 (EAN-128) data in the GTIN format to output in the EAN format (product code format).

Note: Under any of the following conditions, the GTIN format conversion is invalid.

- In scanning bar code types specified for multi-line barcode scanning
- In any of the data edit modes (data extraction mode, data substitution mode, data blocksorting mode, and ADF script mode)

(1) Conversion from UPC/EAN/Interleaved 2of5 (14-digit) to GTIN format

Conversion provides two choices--16- and 14-digit GTIN formats. The former adds the Application Identifier (AI) "01" and Package Indicator PI as a prefix, and the latter, a PI only.

If the GTIN format conversion is enabled, however, the output formats available for UPC-A, UPC-E, EAN-13, and EAN8 do not apply.

UPC-A

- Data read

0 S X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} C/D

0: Padding character for adjustment of the data length
S: Number system character

- Conversion to 16-digit GTIN format (AI "01" and PI added)

0 1 PI 0 S X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} C/D $^{(*1)}$

$^{(*1)}$ Check digits are calculated again and transferred regardless of the transmission specified.

- Conversion to 14-digit GTIN format (PI added)

PI 0 S X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} C/D $^{(*2)}$

$^{(*2)}$ Check digits are calculated again and transferred regardless of the transmission specified.

UPC-A with add-on

- Data read

With 2-digit add-on:

0 S X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} C/D X_{11} X_{12}

With 5-digit add-on:

0 S X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} C/D X_{11} X_{12} X_{13} X_{14} X_{15}

0: Padding character for adjustment of the data length
S: Number system character
$X_{11\text{-}15}$: Add-on code data

- Conversion to 16-digit GTIN format (AI "01" and PI added)

With 2-digit add-on:

0 1 PI 0 S X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} C/D X_{11} X_{12} $^{(*1)}$

With 5-digit add-on:

0 1 PI 0 S X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} C/D X_{11} X_{12} X_{13} X_{14} X_{15} $^{(*1)}$

$^{(*1)}$ Check digits are calculated again and transferred regardless of the transmission specified.

- Conversion to 14-digit GTIN format (PI added)

With 2-digit add-on:

PI 0 S X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} C/D X_{11} X_{12} (*2)

With 5-digit add-on:

PI 0 S X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} C/D X_{11} X_{12} X_{13} X_{14} X_{15} (*2)

(*2) Check digits are calculated again and transferred regardless of the transmission specified.

UPC-E

- Data read

0 X_1 X_2 X_3 X_4 X_5 X_6 C/D

0: Padding character for adjustment of the data length

- Conversion to 16-digit GTIN format (AI "01" and PI added)

X_6=0-2 0 1 PI 0 0 X_1 X_2 X_6 0 0 0 0 X_3 X_4 X_5 C/D (*1)
X_6=3 0 1 PI 0 0 X_1 X_2 X_3 0 0 0 0 0 X_4 X_5 C/D (*1)
X_6=4 0 1 PI 0 0 X_1 X_2 X_3 X_4 0 0 0 0 0 X_5 C/D (*1)
X_6=5-9 0 1 PI 0 0 X_1 X_2 X_3 X_4 X_5 0 0 0 0 X_6 C/D (*1)

(*1) Check digits are calculated again and transferred regardless of the transmission specified.

- Conversion to 14-digit GTIN format (PI added)

X_6=0-2 PI 0 0 X_1 X_2 X_6 0 0 0 0 X_3 X_4 X_5 C/D (*2)
X_6=3 PI 0 0 X_1 X_2 X_3 0 0 0 0 0 X_4 X_5 C/D (*2)
X_6=4 PI 0 0 X_1 X_2 X_3 X_4 0 0 0 0 0 X_5 C/D (*2)
X_6=5-9 PI 0 0 X_1 X_2 X_3 X_4 X_5 0 0 0 0 X_6 C/D (*2)

(*2) Check digits are calculated again and transferred regardless of the transmission specified.

UPC-E with add-on

- Data read

With 2-digit add-on:

0 X_1 X_2 X_3 X_4 X_5 X_6 C/D X_7 X_8

With 5-digit add-on:

0 X_1 X_2 X_3 X_4 X_5 X_6 C/D X_7 X_8 X_9 X_{10} X_{11}

0: Padding character for adjustment of the data length
$X_{7\text{-}11}$: Add-on code data

- Conversion to 16-digit GTIN format (AI "01" and PI added)

With 2-digit add-on:

X_6=0-2 0 1 PI 0 0 X_1 X_2 X_6 0 0 0 0 X_3 X_4 X_5 C/D X_7 X_8 (*1)
X_6=3 0 1 PI 0 0 X_1 X_2 X_3 0 0 0 0 0 X_4 X_5 C/D X_7 X_8 (*1)
X_6=4 0 1 PI 0 0 X_1 X_2 X_3 X_4 0 0 0 0 0 X_5 C/D X_7 X_8 (*1)
X_6=5-9 0 1 PI 0 0 X_1 X_2 X_3 X_4 X_5 0 0 0 0 X_6 C/D X_7 X_8 (*1)

With 5-digit add-on:

X_6=0-2 0 1 PI 0 0 X_1 X_2 X_6 0 0 0 0 X_3 X_4 X_5 C/D X_7 X_8 X_9 X_{10} X_{11} (*1)
X_6=3 0 1 PI 0 0 X_1 X_2 X_3 0 0 0 0 0 X_4 X_5 C/D X_7 X_8 X_9 X_{10} X_{11} (*1)
X_6=4 0 1 PI 0 0 X_1 X_2 X_3 X_4 0 0 0 0 0 X_5 C/D X_7 X_8 X_9 X_{10} X_{11} (*1)
X_6=5-9 0 1 PI 0 0 X_1 X_2 X_3 X_4 X_5 0 0 0 0 X_6 C/D X_7 X_8 X_9 X_{10} X_{11} (*1)

(*1) Check digits are calculated again and transferred regardless of the transmission specified.

- Conversion to 14-digit GTIN format (PI added)

With 2-digit add-on:

X_6=0-2 PI 0 0 X_1 X_2 X_6 0 0 0 0 X_3 X_4 X_5 C/D X_7 X_8 (*2)
X_6=3 PI 0 0 X_1 X_2 X_3 0 0 0 0 0 X_4 X_5 C/D X_7 X_8 (*2)
X_6=4 PI 0 0 X_1 X_2 X_3 X_4 0 0 0 0 0 X_5 C/D X_7 X_8 (*2)
X_6=5-9 PI 0 0 X_1 X_2 X_3 X_4 X_5 0 0 0 0 X_6 C/D X_7 X_8 (*2)

With 5-digit add-on:

X_6=0-2 PI 0 0 X_1 X_2 X_6 0 0 0 0 X_3 X_4 X_5 C/D X_7 X_8 X_9 X_{10} X_{11} (*2)
X_6=3 PI 0 0 X_1 X_2 X_3 0 0 0 0 0 X_4 X_5 C/D X_7 X_8 X_9 X_{10} X_{11} (*2)
X_6=4 PI 0 0 X_1 X_2 X_3 X_4 0 0 0 0 0 X_5 C/D X_7 X_8 X_9 X_{10} X_{11} (*2)
X_6=5-9 PI 0 0 X_1 X_2 X_3 X_4 X_5 0 0 0 0 X_6 C/D X_7 X_8 X_9 X_{10} X_{11} (*2)

(*2) Check digits are calculated again and transferred regardless of the transmission specified.

<u>EAN-13</u>

- Data read

P_1 P_2 P_3 X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 C/D

P*n*: Prefix characters

- Conversion to 16-digit GTIN format (AI "01" and PI added)

0 1 PI P_1 P_2 P_3 X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 C/D (*1)

(*1) Check digits are calculated again and transferred regardless of the transmission specified.

- Conversion to 14-digit GTIN format (PI added)

PI P_1 P_2 P_3 X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 C/D (*2)

(*2) Check digits are calculated again and transferred regardless of the transmission specified.

<u>EAN-13 with add-on</u>

- Data read

With 2-digit add-on:

P_1 P_2 P_3 X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 C/D X_{10} X_{11}

With 5-digit add-on:

P_1 P_2 P_3 X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 C/D X_{10} X_{11} X_{12} X_{13} X_{14}

P*n*: Prefix characters
$X_{10\text{-}14}$: Add-on code data

- Conversion to 16-digit GTIN format (AI "01" and PI added)

With 2-digit add-on:

0 1 PI P_1 P_2 P_3 X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 C/D X_{10} X_{11} (*1)

With 5-digit add-on:

0 1 PI P_1 P_2 P_3 X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 C/D X_{10} X_{11} X_{12} X_{13} X_{14} (*1)

(*1) Check digits are calculated again and transferred regardless of the transmission specified.

- Conversion to 14-digit GTIN format (PI added)

With 2-digit add-on:

PI P_1 P_2 P_3 X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 C/D X_{10} X_{11} (*2)

With 5-digit add-on:

PI P_1 P_2 P_3 X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 C/D X_{10} X_{11} X_{12} X_{13} X_{14} (*2)

(*2) Check digits are calculated again and transferred regardless of the transmission specified.

EAN-8

- Data read

$P_1\ P_2\ P_3\ X_1\ X_2\ X_3\ X_4\ X_5$ C/D

P*n*: Prefix characters

- Conversion to 16-digit GTIN format (AI “01” and PI added)

0 1 PI 0 0 0 0 0 $P_1\ P_2\ X_1\ X_2\ X_3\ X_4\ X_5$ C/D (*1)

(*1) Check digits are calculated again and transferred regardless of the transmission specified.

- Conversion to 14-digit GTIN format (PI added)

PI 0 0 0 0 0 $P_1\ P_2\ X_1\ X_2\ X_3\ X_4\ X_5$ C/D (*2)

(*2) Check digits are calculated again and transferred regardless of the transmission specified.

EAN-8 with add-on

- Data read

With 2-digit add-on:

$P_1\ P_2\ X_1\ X_2\ X_3\ X_4\ X_5$ C/D $X_6\ X_7$

With 5-digit add-on:

$P_1\ P_2\ X_1\ X_2\ X_3\ X_4\ X_5$ C/D $X_6\ X_7\ X_8\ X_9\ X_{10}$

P*n*: Prefix characters

$X_{6\text{-}10}$: Add-on code data

- Conversion to 16-digit GTIN format (AI “01” and PI added)

With 2-digit add-on:

0 1 PI 0 0 0 0 0 $P_1\ P_2\ X_1\ X_2\ X_3\ X_4\ X_5$ C/D $X_6\ X_7$ (*1)

With 5-digit add-on:

0 1 PI 0 0 0 0 0 $P_1\ P_2\ X_1\ X_2\ X_3\ X_4\ X_5$ C/D $X_6\ X_7\ X_8\ X_9\ X_{10}$ (*1)

(*1) Check digits are calculated again and transferred regardless of the transmission specified.

- Conversion to 14-digit GTIN format (PI added)

With 2-digit add-on:

PI 0 0 0 0 0 $P_1\ P_2\ X_1\ X_2\ X_3\ X_4\ X_5$ C/D $X_6\ X_7$ (*2)

With 5-digit add-on:

PI 0 0 0 0 0 $P_1\ P_2\ X_1\ X_2\ X_3\ X_4\ X_5$ C/D $X_6\ X_7\ X_8\ X_9\ X_{10}$ (*2)

(*2) Check digits are calculated again and transferred regardless of the transmission specified.

Interleaved 2 of 5(14-digit)

- Data read

$X_1\ X_2\ X_3\ X_4\ X_5\ X_6\ X_7\ X_8\ X_9\ X_{10}\ X_{11}\ X_{12}\ X_{13}$ C/D

- Conversion to GTIN format (AI “01” added)

0 1 $X_1\ X_2\ X_3\ X_4\ X_5\ X_6\ X_7\ X_8\ X_9\ X_{10}\ X_{11}\ X_{12}\ X_{13}$ C/D (*1)

(*1) Check digits are calculated again and transferred regardless of the transmission specified.

(2) Conversion from GS1 DataBar (RSS)/GS1-128 (EAN-128) in GTIN format to EAN format

GS1 DataBar (RSS) or GS1-128 (EAN-128) data read in the GTIN format (16-digit with AI "01") can be converted to the EAN format if the conversion is enabled. The conversion provides two choices--13- or 14-digit EAN formats. The former trims the Application Identifier (AI) "01" and Package Indicator PI, and the latter, a PI only.

GS1 DataBar (RSS)

- Data read

0 1 PI X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} X_{11} X_{12} C/D

PI: Package indicator

- Conversion to 13-digit EAN format (AI "01" and PI trimmed)

X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} X_{11} X_{12} C/D $^{(*1)}$

$^{(*1)}$ Check digits are calculated again and transferred regardless of the transmission specified. If the transmission of a code ID mark is enabled in the scanner, the code ID mark of EAN-13 is transferred.

- Conversion to 14-digit EAN format (AI "01" trimmed)

PI X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} X_{11} X_{12} C/D

GS1-128 (EAN-128)

- Data read

0 1 PI X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} X_{11} X_{12} X_{13} C/D

PI: Package indicator

- Conversion to 13-digit EAN format (AI "01" and PI trimmed)

X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} X_{11} X_{12} X_{13} C/D $^{(*1)}$

$^{(*1)}$ Check digits are calculated again and transferred regardless of the transmission specified. If the transmission of a code ID mark is enabled in the scanner, the code ID mark of EAN-13 is transferred.

- Conversion to 14-digit EAN format (AI "01" trimmed)

PI X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9 X_{10} X_{11} X_{12} X_{13} C/D

Chapter 10 Image Capturing

10.1 Outline

The scanner supports image capturing that allows you to capture a graphic as a bitmap (BMP) or JPEG image and output it to the host computer. The JPEG image offers three quality choices--standard, high, and low.

The image size can be selected from standard WVGA, 1/4 WVGA and 1/16 WVGA. If you select 1/4 WVGA or 1/16 WVGA, select also the output image area--the full image area or the center portion of the image area. When the full image area is selected, the scanner thins out the resolution of the full image area by skipping every other pixel so that the image quality becomes low; when the center portion is selected, the scanner extracts the center portion of the image area so that the visual area becomes smaller but the image quality does not change.

The scanner can also output a thumbnail to help you aim at a target. The thumbnail images can be saved as a BMP or JPEG image in 1/64 WVGA or 1/4 WVGA, respectively.

You can select the output format, image size, output image area and whether or not to use a thumbnail by modifying the parameters of the IMAGEOUT command.

Note: Selecting the USB keyboard interface disables the image capturing function.

10.2 Image Capturing Specifications

(1) Output file format

BMP or JPEG file format

(2) Image size and output image area

Image size	Number of pixels	BMP	JPEG	Image output area
Standard WVGA	752 × 480	√	√	Full image area
1/4 WVGA	376 × 240	√	√	Full or center portion of the image area
1/16 WVGA	188 × 120	√	√	Full or center portion of the image area
Thumbnail (1/64 WVGA)	94 × 60	√	--	Full image area
Thumbnail (1/4 WVGA)	376 × 240	--	√	Full image area

(3) Communications protocol for image transmission

Xmodem 1K

(4) Image output command

IMAGEOUT#1#m#n Enable the thumbnail transmission
IMAGEOUT#1#m#n#o Disable the thumbnail transmission

The selections available for parameters l, m, n and o are as follows:

l: Output file format

B	BMP
J or J0	JPEG (Medium)
J1	JPEG (High)
J2	JPEG (Low)

m: Image size

0	Standard WVGA
2	1/4 WVGA
4	1/16 WVGA

n: Image output area

F	Full image area
C	Center portion of the image area

o: Thumbnail

0	Disable thumbnail transmission
1 or null	Enable thumbnail transmission of BMP images in 1/64 WVGA
2	Enable thumbnail transmission of JPEG images in 1/4 WVGA

(5) Image capturing operation

1) Upon receipt of an IMAGEOUT command, the scanner captures an image, beeps three times, and switches to the image transmission mode (Xmodem 1K protocol).

2) When the thumbnail is enabled:

   The scanner transmits a thumbnail (BMP file in 1/64 WVGA or JPEG file in 1/4 WVGA) repeatedly.

   Pressing the trigger switch causes the scanner to beep once, capture an image, and start transmission (Xmodem 1K protocol).

   When the thumbnail is disabled:

   The scanner immediately captures an image and transmits it in the format specified by IMAGEOUT parameters (Xmodem 1K protocol).

3) Upon completion of transmission, the scanner beeps once and exits the image transmission mode.

(6) Notes

- Image transmission can only be command-controlled; it cannot be started by the QR-coded parameter menu.
- When the scanner is in the image transmission mode, it cannot scan bar codes or 2D codes. The protocol is fixed to the Xmodem 1K.
- Parameters of the IMAGEOUT command should be uppercase or numerical ASCII characters.
- Transmission condition settings such as header, terminator and transmission speed for the image transmission are the same as those for ordinary commands.
- Transmission speed and other conditions when the Xmodem 1K protocol is used are the same as those with the normal communications protocol (non-acknowledge mode or ACK/NAK mode).
- Upon completion of image transmission, the scanner returns to the normal communications protocol (non-acknowledge mode or ACK/NAK mode).
- In a JPEG file format, images are compression-converted, so the image quality may be lower.

(7) Image transmission time required (Typical)

The table below lists the typical image transmission time required from image capturing to conversion and transmission under the following conditions: Xmodem 1K and 115200 bps. However, this may vary according to the settings made in the host computer.

Image size	Output file format	Image file size	Image transmission time	
			RS-232C	USB-COM
Standard WVGA	BMP	353 kB	32.5 s	3.5 s
1/4 WVGA	BMP	89.2 kB	8.2 s	1.4 s
1/16 WVGA	BMP	23.1 kB	2.5 s	0.5 s
Thumbnail (1/64 WVGA)	BMP	6 kB	1.0 s	0.3 s
Thumbnail (1/4 WVGA)	JPEG	4.8 kB	0.8 s	0.2 s
Standard WVGA	JPEG	25 kB*	3.8 s	0.8 s

* In a JPEG file format, images will be compression-converted, so the file size may vary, depending on images scanned (approx. 10 to 40 kB, usually 25 kB). No compression ratio can be specified.

Chapter 11 Parameters and Defaults

The tables below list the parameters and their defaults. Those parameters can be changed with the QR-coded parameter menu or configuration software (ScannerSetting_2D), except shadowed ones only with the configuration software.

When the scanner leaves the factory, all of these parameters are set to defaults.

(1) Reading mode related parameters

Items	Parameters	Defaults	Refer to:
Data verification read	Regular read mode	√	Section 7.1
	n-point verification scan mode		
	2-point verification scan mode		
Data edit mode	Non-edit mode	√	Section 7.2
	Data extraction mode		
	Data conversion (substitution) mode		
	Blocksorting mode		
	ADF script mode		
Point scanning mode	Enable		Section 7.3
	Disable	√	
Period of double-read prevention	Double-read enable		Chapter 4
	Period of double-read prevention 0.1 to 9.9 s	1 s	

(2) Interface to the host

Items	Parameters	Defaults	Refer to:
Interface	RS-232C interface	√ (Note 1)	Chapter 9
	USB-COM interface	√ (Note 1)	
	USB keyboard interface (Note 2)		

(Note 1) Depending upon the interface plugged into the scanner, the scanner automatically switches to the RS-232C interface or USB-COM interface.

(Note 2) Selecting the USB keyboard interface disables access to the configuration software (ScannerSetting_2D).

: Can be changed only with the configuration software.

(3) Communications parameters for RS-232C interface

The following settings take effect when the RS-232C interface is set up.

Items	Parameters	Defaults	Refer to:
Communications protocol	Non-acknowledge mode	√	Section 9.1 (1)
	ACK/NAK mode		
Transmission speed	4800 bps		Section 9.1 (3)
	9600 bps		
	19200 bps		
	38400 bps	√	
	57600 bps		
	115200 bps		
Data bit	7 bits		Section 9.1 (4)
	8 bits	√	
Parity	Odd		
	Even		
	None	√	
Stop bit	1 bit	√	
	2 bits		
CTS signal monitoring	Enable		Section 9.1 (1)
	Disable	√	
CTS signal monitoring time	0.1 to 9.9 s	2 s	Section 9.1 (1)
ACK/NAK response confirmation time	0.1 to 9.9 s	1 s	
RTS signal control protocol	Scanner ready mode	√	Section 9.1 (2)
	Data ready mode		

(4) Communications parameters for USB-COM interface

The following settings take effect only when the USB-COM interface is set up.

Items	Parameters	Defaults	Refer to:
Communications protocol	Non-acknowledge mode	√	Section 9.2
	ACK/NAK mode		
CTS signal monitor	Enable		Section 9.2
	Disable	√	
CTS signal timeout	0.1 to 9.9 s	2 s	Section 9.2
ACK/NAK response time	0.1 to 9.9 s	1 s	
Remote wake-up	Enable	√	Section 9.2
	Disable		

: Can be changed only with the configuration software.

(5) Communications parameters for USB keyboard interface

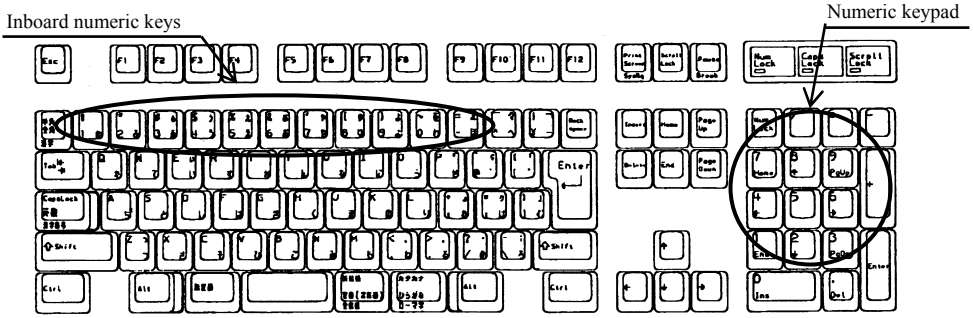
The following settings take effect only when the USB keyboard interface is set up.

Items	Parameters	Defaults	Refer to:
CAPS mode	Manual	√	Section 9.3 (1) (See Note 1.)
	Auto		
Host's CAPS LOCK status	OFF (Lowercase letter)	√	Section 9.3 (1) (See Note 1.)
	ON (Uppercase letter)		
Keyboard type	U.S. English (101 key type)		Section 9.3 (2)
	Germany (102 key type)		
	French (102 key type)		
	U.K. English (102 key type)		
	Italian (102 key type)		
	Swedish (102 key type)		
	Japanese (106 key type)	√	
Numeric key selection (0 to 9)	Inboard numeric keys	√	Section 9.3 (3) (See Note 3.)
	Numeric keypad		
Binary data conversion (See Note 2.)	None (ASCII)	√	Section 9.3 (4)
	Binary conversion		
	Kanji conversion		

(Note 1) Select the Caps Lock state that matches host's keyboard state.

(Note 2) Some applications cannot output data correctly on the display.

(Note 3) When selecting "Numeric keypad for the numeric data transmission format, set the host's NUM LOCK to ON.



Japanese (106 key type)

: Can be changed only with the configuration software.

Items	Parameters	Defaults	Refer to:
Special key transfer mode	Enable		(See Note 4.)
	Disable	√	
Data transmission interval	1 ms		Section 9.3 (5)
	5 ms		
	10 ms	√	
	15 ms		
	30 ms		
	50 ms		
	100 ms		
Remote wake-up	Enable	√	Section 9.3 (6)
	Disable		

(Note 4) Special key transfer applies to the fields except header and terminator in the data transmission format. Enabling this function substitutes E7h to FDh data with the special keys as listed below and transmits the substituted data to the host.

The Left SHIFT, Left CTRL, and Left ALT are transmitted as a simultaneous depression with the subsequent character or key.

Lower \ Upper	E	F
0		↓
1		F1
2		F2
3		F3
4		F4
5		F5
6		F6
7	Left SHIFT	F7
8	Left CTRL	F8
9	Left ALT	F9
A	TAB	F10
B	ESC	F11
C	ENTER	F12
D	←	Right CTRL
E	↑	
F	→	

Special Key Substitution Table

(6) Data transmission format common to all interfaces

Items	Parameters	Defaults	Refer to:
Transmission of code ID mark	Enable		Section 9.4
	Disable	√	
Code ID mark position	Before prefix		Section 9.4
	After prefix	√	
Code ID mark	Type 1 (DENSO1)	√	Section 9.4, (5)
	Type 2 (DENSO2)		
	Type 3		
	Type 4		
	User-defined		
Code ID mark output mode	Coupling	√	Section 9.4, (5)
	Separating		
Transmission of the number of digits (not applicable to UPC/EAN codes)	Enable, in 4 digits		Section 9.4, (6)
	Enable, in 2 digits		
	Disable	√	
Prefix transmission	Enable		Section 9.4, (3)
	Disable	√	
Suffix transmission	Enable		
	Disable	√	
Scanner ID output	Enable		Section 9.4, (2)
	Disable	√	
GTIN format conversion	Enable		Section 9.5
	Disable	√	
Conversion type from UPC/EAN/ Interleaved 2of5 (14-digit) to GTIN format	Conversion to 16 digits	√	
	Conversion to 14 digits		
	Conversion prohibited		
Conversion type from GS1 DataBar (RSS)/GS1-128 (EAN-128) in GTIN format to EAN format	Conversion to 14 digits	√	
	Conversion to 13 digits		
	Conversion prohibited		
Prefix PI in conversion from UPC/EAN/ Interleaved 2of5 (14-digit) to GTIN format	0 to 9	0	

: Can be changed only with the configuration software.

(7) Data transmission format exclusive to RS-232C interface/USB-COM interface

Items	Parameters	Defaults	Refer to:
Header	NONE	√	Section 9.4, (1)
	STX		
	User-defined		
Terminator	NONE		
	ETX		
	CR	√	
	LF		
	CR LF		
	User-defined		
Transmission of BCC	Enabled		Section 9.4, (4)
	Disabled	√	

: Can be changed only with the configuration software.

(8) Data transmission format exclusive to USB keyboard interface

Items	Parameters	Defaults	Refer to:
Header	NONE	√	Section 9.4, (1)
	STX		
	ETX		
	CR		
	LF		
	CR LF		
	TAB		
	ESC		
	ENTER		
	Right Ctrl		
	←		
	↑		
	→		
	↓		
	User-defined		
Terminator	NONE		
	STX		
	ETX		
	CR		
	LF		
	CR LF		
	TAB		
	ESC		
	ENTER	√	
	Right Ctrl		
	←		
	↑		
	→		
	↓		
	User-defined		

: Can be changed only with the configuration software.

(9) 2D codes, mirror image, black-and-white inverted codes and SQRC

Items	Parameters	Defaults	Refer to:
Reading mirror image codes	Enable		Section 7.4
	Disable	√	
Reading black-and-white inverted codes	Black cells/bars on a white background	√	Section 7.5
	White cell/bars on a black background		
	Auto detection of black and white inverted codes		
Edit/Non-edit mode for Structured Appended QR Code	Edit mode	√	Section 7.6
	Batch edit mode		
	Non-edit mode		
Reading MicroQR	Enable	√	Section 12.2
	Disable		
Reading PDF417	Enable	√	
	Disable		
Reading MicroPDF417	Enable		
	Disable	√	
Reading MaxiCode	Enable	√	
	Disable		
Reading DataMatrix (Square)	Enable	√	Section 12.2 (See Note 1.)
	Disable		
Reading DataMatrix (Rectangular)	Enable	√	
	Disable		
QR Code, minimum version readable	1 to 40	1	Section 12.2 (See Note 2.)
QR Code, maximum version readable		40	
MicroQR, minimum version readable	1 to 4	1	
MicroQR, maximum version readable		4	
Data Matrix (Square), minimum code number readable	1 to 24	1	
Data Matrix (Square), maximum code number readable		24	
Data Matrix (Rectangular), minimum code number readable	1 to 6	1	
Data Matrix (Rectangular), maximum code number readable		6	

(Note 1) Using the QR-coded parameter menu enables or disables scanning of both Square and Rectangular Data Matrix symbols at the same time.

(Note 2) The parameter setting ranges are different from versions or code numbers that the scanner can actually read.

: Can be changed only with the configuration software.

Items	Parameters	Defaults	Refer to:
Reading SQRC	Enable (SQRC and QR Code symbols)		Section 7.8
	Enable (SQRC symbol only)		
	Disable	√	
SQRC Encryption key mismatch	Reading disabled	√	
	Enable transmission of disclosure data only		
SQRC Encryption key match	Enable transmission of disclosed data + undisclosed data	√	
	Enable transmission of undisclosed data only		
SQRC Code, minimum version readable	Setting range 1-40	1	Section 12.2
SQRC Code, maximum version readable		40	(See Note 1.)
Reading iQR Code (square)	Enable		Section 12.2
	Disable	√	
iQR Code, (square) minimum version readable	Setting range 1-61	1	Section 12.2 (See Note 1.)
iQR Code, (square) maximum version readable		61	
Reading iQR Code (rectangular)	Enable		Section 12.2
	Disable	√	
iQR Code, (rectangular) minimum version readable	Setting range 1-15	1	Section 12.2 (See Note 1.)
iQR Code, (rectangular) maximum version readable		15	
Edit/Non-edit mode for Structured Appended iQR Code	Edit mode	√	Section 7.6
	Non-edit mode		
Reading Aztec (Full Range)	Enable		Section 12.2
	Disable	√	
Reading Aztec (Compact)	Enable		
	Disable	√	
Aztec, (Full range) minimum version readable	Setting range 1-32	1	Section 12.2 (See Note 1.)
Aztec, (Full range) maximum version readable		32	
Aztec, (Compact) minimum version readable	Setting range 1-4	1	
Aztec, (Compact) maximum version readable		4	

(Note 1) The parameter setting ranges are different from versions or code numbers that the scanner can actually read.

: Can be changed only with the configuration software.

(10) Bar codes

UPC-A/E, EAN-13/8

Items	Parameters	Defaults	Refer to:
Scanning UPC-A and EAN-13	Enable	√	Sections 9.4 and 12.2
	Disable		
UPC-A transmission of check digit	Enable	√	Sections 9.4 and 12.2
	Disable		
UPC-A transmission of number system character	Enable	√	
	Disable		
UPC-A transmission of the leading character	Enable	√	
	Disable		
EAN-13 transmission of check digit	Enable	√	
	Disable		
EAN-13 transmission of country code	Enable	√	Sections 9.4 and 12.2 (See Note 1.)
	Disable		
EAN-13 conversion to the ISBN / ISSN format	Enable		Sections 9.4 and 12.2
	Disable	√	
Reading UPC-E	Enable	√	
	Disable		
UPC-E transmission of check digit	Enable	√	
	Disable		
UPC-E transmission of the leading character	Enable		
	Disable	√	
UPC-E transmission of number system character	Enable	√	
	Disable		
UPC-E conversion to the UPC-A format	Enable		
	Disable	√	

(Note 1) A country code is in the upper two digits of the prefix character field in EAN-13.

: Can be changed only with the configuration software.

Items	Parameters	Defaults	Refer to:
Reading EAN-8	Enable	√	Sections 9.4 and 12.2
	Disable		
EAN-8 transmission of check digit	Enable	√	Sections 9.4 and 12.2
	Disable		
EAN-8 Conversion to the EAN-13 format	Enable		
	Disable	√	
Reading UPC/EAN with 2-digit add-on	Enable		
	Disable	√	
Reading UPC/EAN with 5-digit add-on	Enable		
	Disable	√	
Reading UPC/EAN with add-on only	Enable		
	Disable	√	
Add-on check level	Disabled checking	√	
	Levels 1 to 4		

Interleaved 2of5

Items	Parameters	Defaults	Refer to:
Reading Interleaved 2of5	Enable, without a check digit	√	Section 12.2
	Enable, with a check digit (Check digit transmission enabled)		
	Enable, with a check digit (Check digit transmission disabled)		
	Disable		
Minimum number of readable digits for Interleaved 2of5	2 to 99 digits	4 digits	(See Note 1.)
Maximum number of readable digits for Interleaved 2of5		99 digits	

(Note 1) The parameter setting ranges are different from the numbers of digits that the scanner can actually read.

Standard 2of5

Items	Parameters	Defaults	Refer to:
Reading Standard 2of5	Enable, without a check digit		Section 12.2
	Enable, with a check digit		
	Disable	√	
Standard 2of5 transmission of check digit	Enable	√	
	Disable		
Minimum number of readable digits for Standard 2of5	3 to 99 digits	3 digits	(See Note 1.)
Maximum number of readable digits for Standard 2of5		99 digits	

(Note 1) The parameter setting ranges are different from the numbers of digits that the scanner can actually read.

: Can be changed only with the configuration software.

Codabar (NW-7)

Items	Parameters	Defaults	Refer to:
Reading Codabar (NW-7)	Enable, without a check digit	√	Section 12.2
	Enable, with a check digit (Check digit transmission enabled)		
	Enable, with a check digit (Check digit transmission disabled)		
	Disable		
Minimum number of readable digits for Codabar (NW-7)	3 to 99 digits (including start/stop codes)	4 digits	(See Note 1.)
Maximum number of readable digits for Codabar (NW-7)		99 digits	
Transmission of Start/Stop codes for Codabar (NW-7)	Transmit a/b/c/d	√	Section 12.2
	Transmit A/B/C/D		
	Disable		
Check digit method for Codabar (NW-7)	MOD-16	√	Section 12.2
	7-check method		

(Note 1) The parameter setting ranges are different from the numbers of digits that the scanner can actually read.

Code 39

Item	Parameters	Defaults	Refer to:
Reading Code 39	Enable, without a check digit	√	Section 12.2
	Enable, with a check digit (Check digit transmission enabled)		
	Enable, with a check digit (Check digit transmission disabled)		
	Disable		
Minimum number of readable digits for Code 39	1 to 99 digits (excluding start/stop codes)	1 digit	(See Note 1.)
Maximum number of readable digits for Code 39		99 digits	
Transmission of Start/Stop codes for Code 39	Enable		Section 12.2
	Disable	√	
Conversion to FULL ASCII	Enable		Section 12.2
	Disable	√	

(Note 1) The parameter setting ranges are different from the numbers of digits that the scanner can actually read.

: Can be changed only with the configuration software.

Code 128, GS1-128 (EAN-128)

Items	Parameters	Defaults	Refer to:
Reading Code 128	Enable	√	Section 12.2 (See Note 2.)
	Disable		
Reading GS1-128 (EAN-128)	Enable	√	
	Disable		
Minimum number of readable digits for Code 128	1 to 99 digits (excluding start/stop codes and 1-digit check digit)	1 digit	(See Note 1.)
Maximum number of readable digits for Code 128		99 digits	
Transmission of FNC1 for Code 128	Disable		Section 12.2
	Transmit GS	√	
	User-defined		
Minimum number of readable digits for GS1-128 (EAN-128)	1 to 99 digits (excluding start/stop codes and 1-digit check digit)	1 digit	(See Note 1.)
Maximum number of readable digits for GS1-128 (EAN-128)		99 digits	
Transmission of FNC1 for GS1-128 (EAN-128)	Disable		Section 12.2
	Transmit GS	√	
	User-defined		

(Note 1) The setting ranges are different from the numbers of digits that the scanner can actually read.
(Note 2) Using the QR-coded parameter menu enables or disables scanning of both Code 128 and GS1-128 (EAN-128) at the same time.

Code 93

Items	Parameters	Defaults	Refer to:
Reading Code 93	Enable		Section 12.2
	Disable	√	
Minimum number of readable digits for Code 93	1 to 99 digits (excluding start/stop codes and 2-digit check digits)	1 digit	(See Note 1.)
Maximum number of readable digits for Code 93		99 digits	

(Note 1) The setting ranges are different from the numbers of digits that the scanner can actually read.

: Can be changed only with the configuration software.

GS1 DataBar (RSS), EAN.UCC Composite symbols

Items	Parameters	Defaults	Refer to:
Reading GS1 DataBar Omnidirectional, GS1 DataBar Truncated, GS1 DataBar Limited, GS1 DataBar Expanded (Note 1)	Enable		Section 12.2
	Disable	√	
Reading GS1 DataBar Stacked, GS1 DataBar Expanded Stacked, GS1 DataBar Stacked Omnidirectional (Note 2)	Enable		
	Disable	√	
Transmission of FNC1 for GS1 DataBar (RSS) Expanded code	Enable		
	Transmit GS	√	
	User-defined		
Reading EAN.UCC Composite symbols	Enable		
	Disable	√	
Reading RSS Composite with CC-A	Enable		
	Disable	√	
Reading RSS Composite with CC-B	Enable		
	Disable	√	
Reading UPC/EAN Composite with CC-A	Enable		
	Disable	√	
Reading UPC/EAN Composite with CC-B	Enable		
	Disable	√	
Reading GS1-128 (EAN-128) Composite with CC-A	Enable		
	Disable	√	
Reading GS1-128 (EAN-128) Composite with CC-B	Enable		
	Disable	√	
Reading GS1-128 (EAN-128) Composite with CC-C	Enable		
	Disable	√	

(Note 1) Indicates GS1 DataBar Omnidirectional (RSS-14), GS1 DataBar Truncated (RSS-14 Truncated), GS1 DataBar Limited (RSS Limited) and GS1 DataBar Expanded (RSS Expanded).

(Note 2) Indicates GS1 DataBar Stacked (RSS-14 Stacked), GS1 DataBar Stacked Omnidirectional (RSS-14 Stacked Omnidirectional) and GS1 DataBar Expanded Stacked (RSS Expanded Stacked).

(Note 3) In the QR Code menu, the GS1 DataBar (RSS codes) cannot separately be selected and they are enabled or disabled all together.

(Note 4) In the QR Code menu, the COMPOSITE codes cannot separately be selected and they are enabled or disabled all together.

: Can be changed only with the configuration software.

Multi-line barcode scanning

Items	Parameters	Defaults	Refer to:
Reading multi-line bar codes	Enable		Section 7.7
	Disable	√	
Number of lines for multi-line barcode scanning	Two lines	√	
	Three lines		
Output format for multi-line bar codes	Header/Terminator-delimited		
	Comma-delimited	√	
First-line barcode	Selectable from readable bar codes	Not specified.	
First-line barcode character	Up to 2 ASCII characters	Not specified.	
First-line barcode minimum number of readable digits	Max. 99 digits	Not specified.	
First-line barcode maximum number of readable digits	Max. 99 digits	Not specified.	
Second-line barcode	Selectable from readable bar codes	Not specified.	
Second-line barcode character	Up to 2 ASCII characters	Not specified.	
Second-line barcode minimum number of readable digits	Max. 99 digits	Not specified.	
Second-line barcode maximum number of readable digits	Max. 99 digits	Not specified.	
Third-line barcode	Selectable from readable bar codes	Not specified.	
Third-line barcode character	Up to 2 ASCII characters	Not specified.	
Third-line barcode minimum number of readable digits	Max. 99 digits	Not specified.	
Third-line barcode maximum number of readable digits	Max. 99 digits	Not specified.	

: Can be changed only with the configuration software.

(11) Trigger switch control

Items	Parameters	Defaults	Refer to:
Trigger switch control mode	Auto-off mode	√	Section 6.1
	Momentary switching mode		
	Momentary switching mode (Reverse Type)		
	Alternate switching mode		
	Continuous reading mode 1		
	Continuous reading mode 2		
	Auto sensing mode		Section 6.3
	Auto stand mode		
Auto-off mode reading time (One shot mode)	1 s		Section 6.1
	2 s		
	3 s		
	4 s		
	5 s	√	
Time from Auto stand mode to Auto sensing mode	1 s		Section 6.3
	2 s	√	
	3 s		
	4 s		
	5 s		
	6 s		
	7 s		
	8 s		
	9 s		
Error issue when reading fails	Enable		Section 6.1
	Disable	√	
Sensibility level	High		Section 6.3
	Medium	√	
	Low		
Interface switching when power turned ON (Note1)	Enable		Section 2.1
	Disable	√	
USB Keyboard Interface Auto-Switching (Note2)	Enable	√	Section 2.1
	Disable		

(Note1) This function is applied to the firmware version Ver.1.00 or Ver.1.01.

(Note2) This function is applied to the firmware version Ver.1.10 or later.

: Can be changed only with the configuration software.

(12) Beeper, indicator LED, marker and illumination LEDs

Items	Parameters	Defaults	Refer to:
Beeper control	Enable	√	Section 8.1
	Disable		
Beeping tone	Low beeping tone (2.8 kHz)		
	Medium beeping tone (3.0 kHz)	√	
	High beeping tone (4.0 kHz)		
Beeper beep time	Short (60 ms)		
	Medium (80 ms)	√	
	Long (120 ms)		
Beeper volume	High	√	
	Medium		
	Low		
Scan complete sound	Single beep	√	Section 8.1
	Multiple beep		
Indicator LED control	Enable	√	Section 8.2
	Disable		
Marker	Marker-OFF mode		Section 8.3
	Normal marker mode	√	
	Marker-ON mode		
Beeper sound when power turned ON	Enable		Section 8.1
	Disable	√	
Illumination LED	turns off		Section 8.4
	turns on	√	
Power save mode	Enable (Note1)		Section 8.4
	Disable	√	

(Note1) When “Power save mode” is enabled, a reading distance may be shorter under 500 lx ambient illumination.

: Can be changed only with the configuration software.

(13) Data verification conditions and data editing conditions

Items	Parameters	Defaults	Refer to:
Data to be verified	Data block verification		Section 7.1
	Data string verification	√	
Preset registration	Enable		
	Disable	√	
Verification start position for data string verification	001 to 999 positions (Specify with ASCII characters)	1	
Number of characters to verify for data string verification (without preset master registration)	01 to 99 positions (Specify with ASCII characters)	99	
Position of data block to verify for data block verification	01 to 99 positions (Specify with ASCII characters)	1	
Transmission of verification result for a match (When verification OK)	Disable	√	
	Enable code data transmission		
	Enable OK transmission		
Transmission of verification result for a mismatch (When verification NG)	Disable	√	
	Enable code data transmission		
	Enable NG transmission		
Verification retry after fail judgment in 2-point verification	Enable		
	Disable	√	
Verification range	Code type + code data	√	
	Code data only		
Code type in data editing	Selectable from codes available	Any code (Note 1)	Section 7.2
Transmit data regardless of the results	Enable		
	Disable	√	
Data extraction mode	Data string extraction mode	√	
	Extraction block mode		
	AI mode		
Data string extraction mode - Start position	First position		
	Last position		
	Specified position	√	
Data string extraction mode - End position	Last character	√	
	Specified digits		
	Specified position		
Data string extraction mode - Specified position for extraction start position	0001 to 9999 positions (Specify with ASCII characters)	1	
Data string extraction mode - Specified position for extraction last position	0001 to 9999 positions (Specify with ASCII characters)	9999	
Extraction block mode - Extraction block number (Maximum 3 blocks)	01 to 99 positions (Specify with ASCII characters)	Not specified.	

(Note 1) Selecting “Any code” edits all types of codes.

: Can be changed only with the configuration software.

Items	Parameters	Defaults	Refer to:
Search string and substitution string in data substitution mode	Max. 16 ASCII characters	No specified.	Section 7.2
Number of splits in data blocksorting mode	2 to 5 splits	2	
Split position in data blocksorting mode	0001 to 9999 positions, specified by ASCII characters	Single character	
Order of blocks in data blocksorting mode	Blocks 1 to 5	Block 1/ Block 2	
AI mode	AI split mode	√	
	AI parenthesis mode		
AI split mode - Availability of AI #1	Enable	√	
	Disable		
AI split mode - Availability of AI #2	Enable		
	Disable	√	
AI split mode - Availability of AI #3	Enable		
	Disable	√	
AI split mode - AI #1	Selectable from AI candidates (Note 2)	00	
AI split mode - AI #2	Selectable from AI candidates (Note 2)	00	
AI split mode - AI #3	Selectable from AI candidates (Note 2)	00	
AI split mode - Delimiter	Header/Terminator	√	
	Comma		
	Tab (09h)		

(Note 2) For details about AI candidates, refer to Chapter 7, Section 7.2.1.3, "(3) AI table."

: Can be changed only with the configuration software.

Chapter 12 QR-Coded Parameter Menu

12.1 Parameter Setting Procedure Using the QR-coded Parameter Menu

Start setting	Use the scanner to scan the “Start setting” QR Code symbol.
↓ Three beeps	
Scan parameter setting QR Code symbols.	Scan necessary parameter setting QR Code symbols.
↓	
End setting	Scan the “End setting” QR Code symbol.
Three beeps	

Scanning the “All defaults” QR Code symbol in the QR-coded parameter menu makes all items in the menu revert to the factory defaults.

12.2 QR-coded Parameter Menu

■ **Menu control (Starting/Ending the Setting Procedure and Reverting to Defaults)**

Start setting

Start setting
(When the “White code on black background” is set”)

Cancel

All defaults

End setting

The beeper volume can be set by scanning the following QR Code symbol only. No “Start setting” or “End setting” QR Code symbol required to be scanned.

Adjusting the beeper volume

Scanning this QR Code symbol cycles the beeper volume through High, Medium and Low. The factory default is High.

Beeper volume

■ Communications parameters for RS-232C interface

Procedure

Non-acknowledge mode
(default)

ACK/NAK mode

Transmission speed

4800 bps

9600 bps

19200 bps

38400 bps
(default)

57600 bps

115200 bps

Data bit

7 bits

8 bits (default)

Parity

None (default)

Even parity

Odd parity

Stop bit

1 bit (default)

2 bits

■ **USB interface to the host**

USB-COM interface (default)

USB keyboard interface

■ Communications parameters for USB-COM interface

Communications protocol (USB-COM interface)

Non-acknowledge mode (default)

ACK/NAK mode

Header (USB-COM interface)

None (default)

STX

Terminator (USB-COM interface)

None

ETX

CR (default)

LF

CR LF

Transmission of BCC (USB-COM interface)

Disable (default)

Enable

■ **Communications parameters for USB keyboard interface**

Conversion to binary data

No conversion (default)
(ASCII)

Binary conversion

Kanji conversion

Header (USB keyboard interface)

None (default)

STX

ETX

CR

LF

CR LF

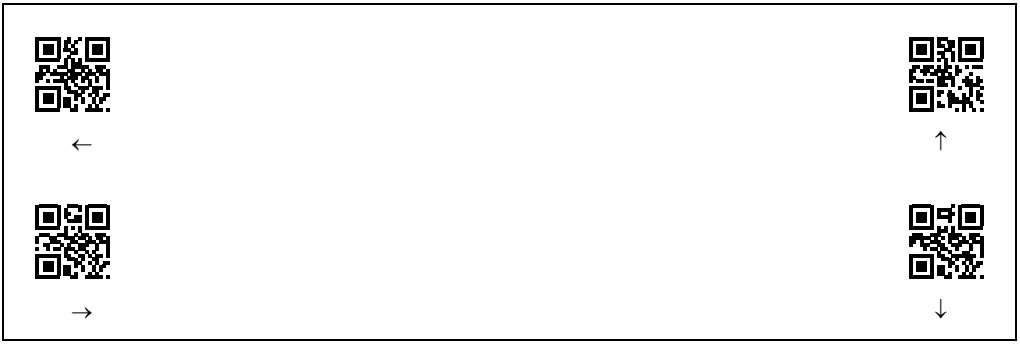
TAB

ESC

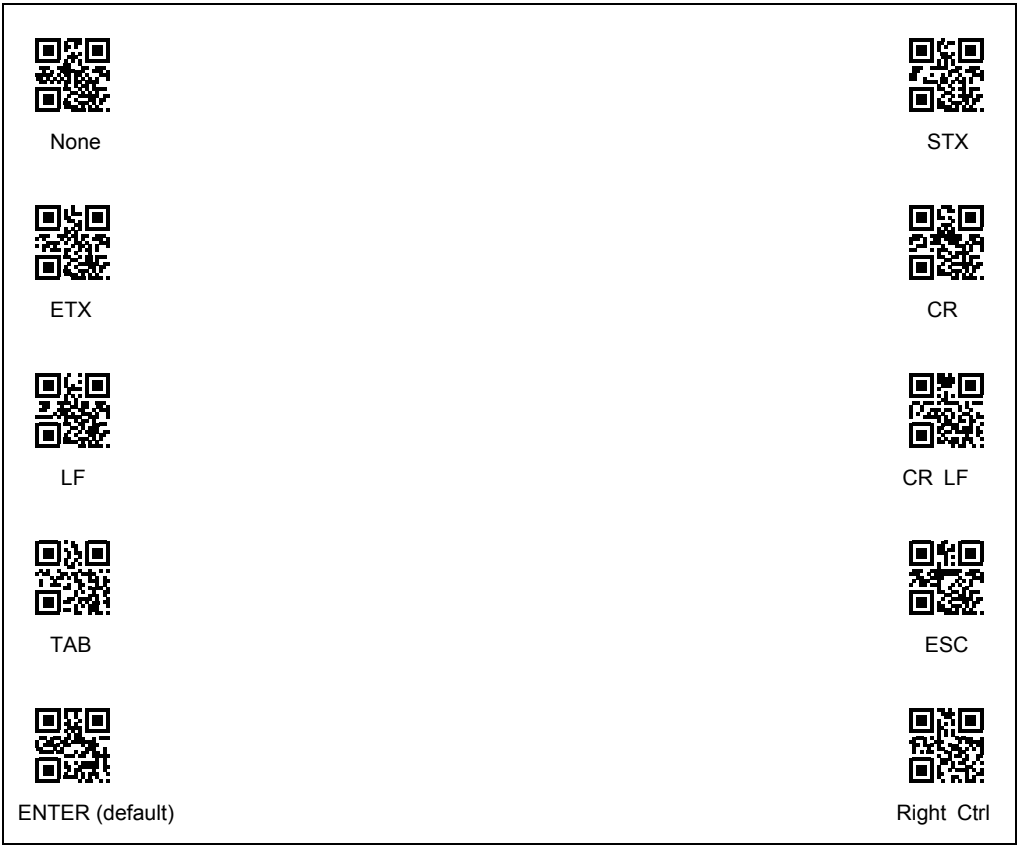
ENTER

Right Ctrl

Header (USB keyboard interface)



Terminator (USB keyboard interface)



Terminator (USB keyboard interface)

←

↑

→

↓

■ **Data transmission format**

Transmission of code ID mark

Disable (default)

Enable

Transmission of the number of digits

Disable (default)

Enable in 2 digits

Enable in 4 digits

■ **2D codes, mirror image and black-and-white inverted codes**

Scanning MicroQR Code

Disable

Enable (default)

Scanning black-and-white inverted codes

Black cells/bars on a white background (default)

White cells/bars on a black background

Automatically identify black and white inverted codes

Scanning Structured Appended QR (iQR) Code

Edit mode (default)

Non-edit mode

Batch edit mode

Scanning PDF417

Disable

Enable (default)

Scanning MaxiCode

Disable

Enable (default)

Scanning Data Matrix

Disable

Enable (default)

■ **Bar codes**

Scanning UPC-A, UPC-E, EAN-13 and EAN-8

Disable

Enable (default)

Scanning Interleaved 2of5

Disable

Enable with a check digit
(Check digit transmission disabled)

Enable without
a check digit (default)

Enable with a check digit
(Check digit transmission enabled)

Scanning Code 128 (GS1-128 (EAN-128))

Disable

Enable (default)

Scanning Codabar (NW-7)

Disable

Enable without a check digit (default)

Enable with a check digit
(Check digit transmission enabled)

Enable with a check digit
(Check digit transmission disabled)

Transmission of start/stop codes for Codabar (NW-7)

Disable

Enable (default)

Scanning Code 39

Disable

Enable without a check digit (default)

Enable with a check digit
(Check digit transmission enabled)

Enable with a check digit
(Check digit transmission disabled)

Transmission of start/stop codes for Code 39

Disable (default)	Enable

Scanning Code 93

Disable (default)	Enable

Scanning GS1 DataBar (RSS)

Disable (default)	Enable

Scanning Composite

Disable (default)	Enable

■ **Other settings**

Trigger switch control

Auto-off mode (default)

Alternate switching mode

Momentary switching mode

Momentary switching mode (Reverse type)

Continuous reading mode 1

Continuous reading mode 2

Auto sensing mode

Auto stand mode

Beeper control

Disable

Enable (default)

Indicator LED

Disable

Enable (default)

Power save mode

Disable (default)

Enable

Chapter 13 Troubleshooting

Problem 1: Low reading efficiency.

Probable cause	What to do:
• A target code is not within the reading area of the reading window.	• Bring a code within the reading area.
• The code may be smeared.	• Wipe off the dirt from the code.
• The code may be blurred.	• Use a code clearly printed.

Problem 2: Cannot read 2D codes or bar codes.

Probable cause	What to do:
• The type of the code to be scanned has not been set as a readable code.	• Enable the type of the code to be scanned as a readable code.
• The scanned bar code contains no check digit, while the "Enable, with a check digit" parameter is selected.	• Select the "Enable, without a check digit" parameter.
• The check digit contained in the scanned bar code is wrong.	• Use a correct bar code.

Problem 3: Code data cannot be displayed normally on the computer screen. (USB-COM interface)

Probable cause	What to do:
• The communications conditions of the scanner are different from those of the connected host.	• Change the communications conditions of the scanner to match those of the connected host.
• Any device driver other than our Active USB-COM port driver may be used.	• Use our Active USB-COM port driver that is designed for the USB-COM interface.

Problem 4: Code data cannot be displayed normally on the computer screen. (USB keyboard interface)

Probable cause	What to do:
• The keyboard type selected may not match one that is set up in the host computer.	• Select the same keyboard type as one that is set up in the host computer. (You can check the computer's keyboard type by clicking **My Computer** | **Control Panel** | **Keyboard** | **Hardware**.)
• The Caps Lock state selected may not match that of the connected keyboard.	• Select the same Caps Lock state as that of the connected keyboard.
• Any device driver other than the system-supplied driver (USB device class driver for HID) may be used.	• Use the system-supplied driver.
• The computer's keyboard may be held down.	• Do not press the computer's keyboard when scanning codes.

Appendix 1 Specifications

Item		AT20Q-SM
Scanning specifications	Readable codes	QR Code (Model 1 and Model 2), MicroQR, SQRC (*1), iQR, PDF417, MicroPDF417, MaxiCode, Data Matrix, Aztec and EAN.UCC Composite symbol EAN-13/8, UPC-A/E, UPC/EAN with add-on, Interleaved 2of5 (ITF), Standard 2of5, Code 39, Codabar (NW-7), Code 93, Code 128, GS1-128 (EAN-128), and GS1 DataBar (RSS)
	Skew angle	360º
	Scanning resolution	0.167 mm min. for two-dimensional codes (*2) 0.125 mm min. for bar codes
	Elevation angle (skew)	±50°
	Tilt angle (pitch)	±50°
	Light source	LED (red)
	Reading confirmation	Blue LED, beeper
Interface		RS-232C interface, USB-COM interface, and USB keyboard interface
Input power requirements	Operating voltage	5.0 V DC ±5%
	Power consumption (in Auto-off mode)	Max. 500 mA
Environmental conditions	Operating temperature range	-5 to 50°C
	Operating humidity range	10% to 90% RH (*3)
	Storage temperature range	-10° to 60°C
	Storage humidity range	5% to 95% RH (*3)
	Ambient illuminance range	Max. 10000 lux
Dimensions (W) × (D) × (H)		80 × 158 × 63 mm
Weight		Approx. 110 g (excluding the cable)

(*1) To use SQRC (Security QR Code), contact your Denso Wave representative.

(*2) Applied to QR Codes and Data Matrix.

(*3) Sharp temperature change, dewing or freezing not allowed, wet-bulb temperature 30°C max.

Appendix 2 Control Commands

Control commands refer to commands that are exchanged between the host computer and the scanner via the communications line.

Some of the control commands that the host computer issues are functionally equivalent to some parameters that can be set with the QR-coded parameter menu (refer to Chapter 11). Control command settings have priority over settings made with the QR-coded parameter menu.

Note that turning off the scanner will clear control command settings so that settings made with the QR-coded parameter menu will take effect unless the PW command is sent to the scanner for saving control command settings into the EEPROM.

If commands other than ones listed below are sent to the scanner, the scanner operation is not assured.

Note: Selecting the USB keyboard interface disables the control commands.

Note: Until the completion of execution of a specified control command, the subsequent command will not be executed.

Note: After recognition of the virtual COM port when the USB-COM interface is used, the scanner requires a maximum of one second to be ready to receive control commands.

Control Commands	Transfer Direction Scanner ⟷ Host	Function
Z (Note 1) (Note 2)	←	Switch to standby Upon receipt of the Z, READOFF or LOFF command, the scanner switches to standby as long as the trigger switch control is set to continuous reading mode 1 or 2.
READOFF	←	
LOFF	←	
R (Note 1)	←	Ready to scan Upon receipt of the R, READON or LON command, the scanner becomes ready to scan as long as the trigger switch control is set to continuous reading mode 1 or 2.
READON	←	
LON	←	
B1 B2 B3 (Note 3) (Note 4)	←	Sound the beeper Within 100 ms from the receipt of any of B1, B2 and B3 commands, the scanner beeps for the period specified below. B1: Beep for approx. 60, 80, 120, or 140 ms B2: Beep for approx. 120 ms B3: Beep for approx. 240 ms Even if the beeping is prohibited or the scanner is on standby, the beeper will be able to sound.
BH1, BM1, BL1 BH2, BM2, BL2 BH3, BM3, BL3 (Note 3) (Note 4)	←	Specifies the beeper tone. Adding this command to B1, B2 and B3 commands allows the scanner to beep at the specified frequency. H: High (4.0 kHz) M: Medium (3.0 kHz) L: Low (2.8 kHz)
LB (Note 3)	←	Light the blue indicator LED Within 100 ms from the receipt of the LB command, the blue indicator LED lights for approx. 500 ms.
LG (Note 3)	←	Light the green indicator LED Within 100 ms from the receipt of the LG command, the green indicator LED lights for approx. 500 ms.

Control Commands	Transfer Direction Scanner ⟷ Host	Function
LR (Note 3)	←	Light the red indicator LED Within 100 ms from the receipt of the LR command, the red indicator LED lights for approx. 500 ms.
IMAGEOUT	←	Capture image Refer to Chapter 10 for details.
U1 U2 U3 U4 U5 U6 U7 U8	←	Trigger switch control U1: Auto-off mode U2: Momentary switching mode U3: Alternate switching mode U4: Continuous reading mode 1 U5: Continuous reading mode 2 U6: Auto sensing mode U7: Auto stand mode U8: Momentary switching mode (Reverse type)
PW (Note 5)	←	Save parameters This command saves settings made with U1 through U8 commands into the EEPROM. Without the PW command, the scanner will lose settings made with U1 through U8 when it is turned off.
VER	←	Request for software version <Response from the scanner> Ver.n.nn where n.nn is version number (Ex. Ver.1.00)
VERF	←	Request for the parameter setting version This command checks the version of the parameter settings made in the scanner when the scanner is linked with the configuration software (ScannerSetting_2D). <Response from the scanner> Ver.n.nn.mm where n.nn.mm is version number (Ex. Ver.1.00.00) and mm is parameter setting version.
E	←	Request for scan entry mode In scan master registration for n-point verification, switching the scanner to the Data verification mode, sending a scan entry control command “E” from the host, and scanning a master code with the scanner registers the master data which is saved in the EEPROM.
ID	←	Request for scanner ID (serial number) <Response from the scanner> ID.nnnnnn where nnnnnn is a serial number (Ex. ID.000001)
TMON (Note 6)	←	Enable trigger switch It enables the trigger switch control.
TMOFF (Note 6)	←	Disable trigger switch It disables the trigger switch control and switches the scanner standby.
ERROR	→	Scanning failure When the scanner (which is ready to scan) cannot complete scanning and switches to standby, it sends the ERROR command as long as the trigger switch control is set to continuous reading mode 1 or 2. Whether or not to send this command can be selected.

Control Commands	Transfer Direction Scanner ⟷ Host	Function
OK	→	Verification match If code data scanned matches master data in Data verification mode, the scanner sends this command as long as the OK transmission is enabled for a match.
NG	→	Verification mismatch If code data scanned does not match master data in Data verification mode, the scanner sends this command as long as the NG transmission is enabled for a mismatch.

(Note 1) If the scanner receives the R command twice with the reading window being applied to a code (for example, it receives the R command, sends the code data read, and receives the Z and R commands), it will send even the same code data twice. This is because the Z command cancels the duplication prevention processing.

In Structured Appended QR (iQR) Code scanning operation, if the scanner receives the Z command and switches to standby before scanning a set of Structured Appended QR (iQR) Code symbols, the duplication prevention processing will be canceled. The code data that has been read halfway will be discarded.

The READOFF and LOFF commands produce the same result as the Z command, the READON and LON commands, as the R command.

(Note 2) When the scanner is on standby, pressing the trigger switch may light the LEDs momentarily, but the scanner cannot scan codes.

(Note 3) After receipt of one of the B1 to B3, BH1 to BH3, BM1 to BM3, BL1 to BL3, LB, LG, LR and VO command, the scanner may need a maximum of 100 ms to execute the command.

(Note 4) Beeping specified by control commands B1, BH1, BM1, and BL1 is dependent on the reading completion sound and its length.

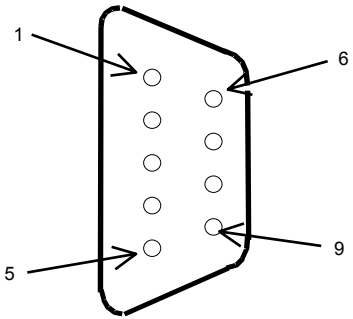
(Note 5) The PW can save settings into the EEPROM a maximum of 1,000,000 times due to the restrictions on the EEPROM.

(Note 6) These control commands are available only when the scanner is not in Data verification mode.

Appendix 3 Interface Specifications

■ RS-232C Interface

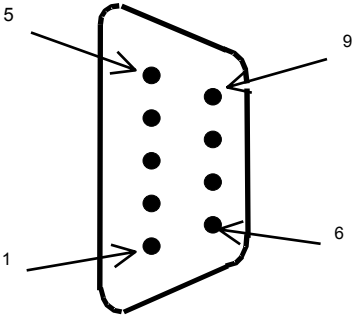
Dsub 9pin ,socket type



(Viewed from pin side)

	Power supplied from AC adapter	Power supplied from host
Pin #	Signal	
1	N.C.	N.C.
2	TxD	TxD
3	RxD	RxD
4	Shorted wit #6	N.C.
5	GND	GND
6	Shorted wit #4	N.C.
7	CTS	CTS
8	RTS	RTS
9	N.C.	5V DC

D-Sub 9pin plug type（Power supplied from host type only）

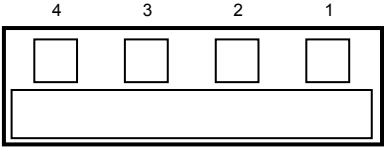


(Viewed from pin side)

Pin #	Signal
1	N.C.
2	TxD
3	RxD
4	N.C.
5	GND
6	N.C.
7	CTS
8	RTS
9	5V DC

■ USB Interface

Type A USB connector



Viewed from pin side

Pin #	Signal
1	5V DC
2	D-
3	D+
4	GND

2D Code Handy Scanner

AT20Q-SM
AT21Q-SM

User's Manual

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